ENERGY SAVINGS PLAN

SUBMITTED BY:
DCO Energy Efficiency Division
100 Lenox Drive
Lawrenceville, NJ 08648
Rev 1
10/1/2021

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ENERGY SAVINGS PLAN

SECTION 1 – PROJECT OVERVIEW

Project Overview

The Energy Savings Plan (ESP) is the core of the Energy Savings Improvement Program (ESIP) process. It describes Passaic Valley Regional High School's preferred Energy Conservation Measures (ECMs), the budget cost for each ECM and the ECM energy savings calculations that self-fund the project via reduced operating costs. The ESP provides Passaic Valley Regional High School the necessary information to decide which proposed ECMs to implement as part of your (ESIP) project. Working with the school's staff, your selected ESIP project would:

1. Self-fund $1,429,436 of building improvements
2. Generate $94,827 in annual energy savings – 40% of current utility spend
3. Qualify for $409,430 in energy efficiency rebates
4. Reduce annual CO2 emissions by 473 metric tons – a 38% reduction

NOTE: This submitted ESP doesn't constitute any contractual obligation between Passaic Valley Regional High School and DCO Energy (DCO). Any contractual obligations will be performed under separate legal documents per mutual signed agreement of the parties involved and subject to the applicable laws and requirements of the ESIP legislation and State of New Jersey.

To ensure conformance with the requirements of Public Finance Notice LFN 2009-11, the ESP must address the following elements:

- *The results of the energy audit (APPENDIX G)*
- *A description of the energy conservation measures that will comprise the program; (Section 3)*
- *An estimate of greenhouse gas reductions resulting from those energy savings (Section 3);*
- *Identification of all design and compliance issues and identification of who will provide these services; (Section 5)*
- *An assessment of risks involved in the successful implementation of the plan; (Section 5)*
- *Identify the eligibility for, and costs and revenues associated with the PJM Independent System Operator for demand response and curtailable service activities; (Section 3)*
- *Schedules showing calculations of all costs of implementing the proposed energy conservation measures and the projected energy savings; (Section 3)*

- *Maintenance requirements necessary to ensure continued energy savings, and describe how they will be provided; and (Section 6)*
- *If developed by an ESCO, a description of, and cost estimates of a proposed energy savings guarantee. (Section 7)*

In addition, and per LFN 2009-11, the ESP requires several other important elements:

- *The calculations of energy savings must be made in accordance with protocols for their calculation adopted by the BPU. The calculation shall include all applicable State and federal rebates and tax credits, but shall not include the cost of an energy audit and the cost of verifying energy savings. (Section 3)*
- *An independent third party must review the plan and certify that the plan savings were properly calculated pursuant to the BPU protocols.*
- *If an ESCO is used to prepare the plan, the ESCO must provide an estimate of the cost of a guarantee of energy savings. When adopting the plan, the local unit must decide whether or not to accept the guarantee (covered below). (Section 7)*
- *The plan must be verified by an independent third party to ensure that the calculations were made in accordance with the BPU standards and that all required elements of the ESP are covered.*
- *After verification is completed, the governing body must formally adopt the plan. At that point, the plan must be submitted to the Board of Public Utilities where it will be posted on the BPU website. BPU approval is not required. If the contracting unit maintains its own website, the plan must also be posted on that site.*

DCO Energy looks forward to the third-party review of our energy calculations and Passaic Valley Regional High School's approval of the Energy Savings Plan to implement via the requirements of the ESIP legislation. Your time, effort, and support is appreciated.

ENERGY SAVINGS PLAN

SECTION 2 – ENERGY BASELINE

Total Utility Consumption and Site EUI

The Passaic Valley Regional High School Energy Savings Plan includes 1 building totaling 248,607 square feet. To develop the ESP, DCO Energy was provided with all available utility data (electric, natural gas and solar). DCO Energy tracked and documented this utility data from June 2018 thru May 2019. A listing of the building, the total utility consumption, and Energy Usage Index is detailed below.

BUILDINGS & FACILITIES		
BUILDING #	BUILDING/FACILITY NAME	SQFT
1	**Passaic Valley Regional HS**	**248,607**

PASSAIC VALLEY REGIONAL HIGH SCHOOL BUILDINGS/FACILITIES		ELECTRIC					
BUILDING/FACILITY NAME	SQFT	USAGE kWh	DEMAND kW	USAGE kWh / SQFT	USAGE BTU / SQFT	TOTAL COST $$	BLENDED COST $$ / kWh
Passaic Valley Regional HS	248,607	1,383,777	961	5.6	18,992	$149,560	$0.108
TOTALS	**248,607**	**1,383,777**	**961**	**5.6**	**18,992**	**$149,560**	**$0.108**

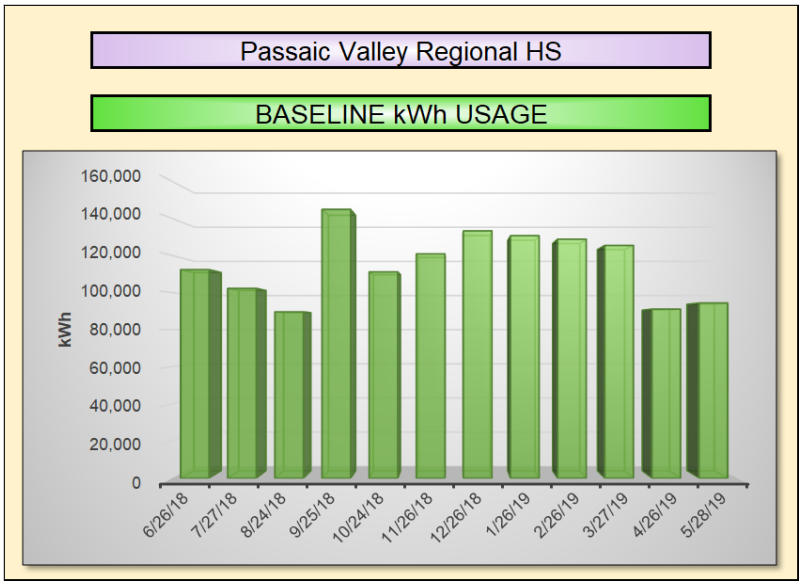
PASSAIC VALLEY REGIONAL HIGH SCHOOL BUILDINGS/FACILITIES		NATURAL GAS			
BUILDING/FACILITY NAME	SQFT	USAGE THERMS	USAGE BTU / SQFT	TOTAL COST $$	BLENDED COST $$ / THERM
Passaic Valley Regional HS	248,607	99,987	40,219	$93,204	$0.93
TOTALS	**248,607**	**99,987**	**40,219**	**$93,204**	**$0.93**

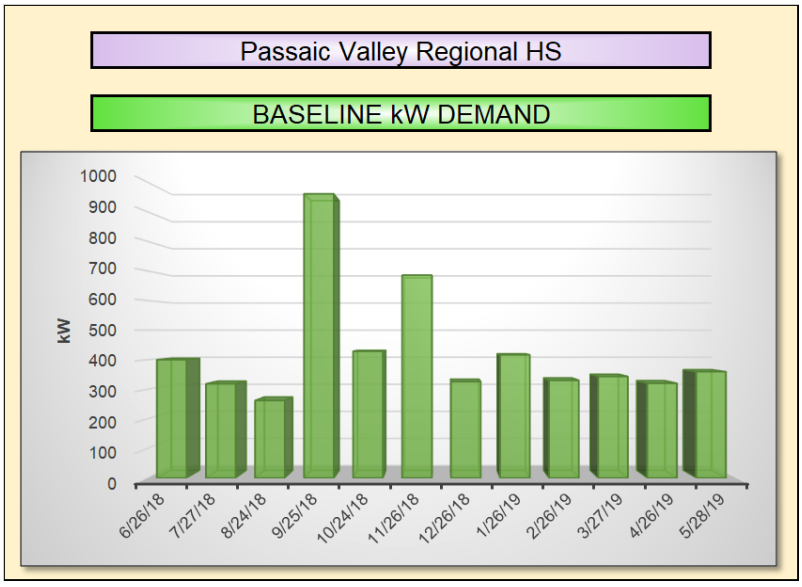
PASSAIC VALLEY REGIONAL HIGH SCHOOL BUILDINGS/FACILITIES		SITE ENERGY	SOURCE ENERGY	TOTAL COST
BUILDING/FACILITY NAME	SQFT	USAGE BTUs	USAGE BTUs	$$
Passaic Valley Regional HS	248,607	16,035,263,152	25,033,804,850	$270,653
TOTALS	**248,607**	**16,035,263,152**	**25,033,804,850**	**$270,653**

PASSAIC VALLEY REGIONAL HIGH SCHOOL BUILDINGS/FACILITIES		SITE EUI			SITE ECI		
BUILDING/FACILITY NAME	SQFT	USAGE BTU / SQFT	NATIONAL MEDIAN BTU / SQFT	NATIONAL MEDIAN +/- %	COST $$ / SQFT	NATIONAL MEDIAN $$ / SQFT	NATIONAL MEDIAN +/- %
Passaic Valley Regional HS	248,607	64,500	48,500	-33%	$1.09	$0.97	-12%
TOTALS	**248,607**	**64,500**	**48,500**	**-33%**	**$1.09**	**$0.97**	**-12%**

On the following pages is a detailed account of each of the utility accounts and meters provided to DCO Energy.

Passaic Valley Regional High School Baseline Energy Use





Passaic Valley Regional HS						ELECTRIC METER #1					
Provider:	PSE&G			4247204505				Meter #:	9210179		
Commodity:	Talen Energy			E Main St.				Rate Tariff:	Large Power & Lighting Secondary		
Billing Period Start Date	Actual Reading	Usage kWh Net	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	$ / kWh Marginal Rate	Days	Load Factor	BTU
5/26/18	6/26/18	107,751	400	$1,338	$100	$4,831	$6,269	$0.0133	32	35%	367,646,412
6/27/18	7/27/18	97,983	319	$1,252	$91	$3,849	$5,192	$0.014	31	41%	334,317,996
7/28/18	8/24/18	85,091	262	$1,136	$7,037	$3,164	$11,337	$0.096	28	48%	290,330,492
8/25/18	9/25/18	139,008	961	$1,621	$11,496	$5,805	$18,922	$0.094	32	19%	474,295,296
9/26/18	10/24/18	104,184	428	$1,214	$8,828	$1,611	$11,653	$0.096	29	35%	355,475,808
10/25/18	11/26/18	108,027	686	$1,257	$9,186	$1,273	$11,716	$0.097	33	20%	368,588,124
11/27/18	12/26/18	119,374	326	$1,329	$10,151	$1,221	$12,700	$0.096	30	51%	407,304,088
12/27/18	1/26/19	116,397	416	$1,344	$9,699	$1,560	$12,602	$0.095	31	38%	397,146,564
1/27/19	2/26/19	115,237	330	$1,339	$9,562	$1,238	$12,138	$0.095	31	47%	393,188,644
2/27/19	3/27/19	113,223	343	$1,322	$9,406	$1,286	$12,014	$0.095	29	47%	386,316,876
3/28/19	4/26/19	82,184	320	$1,125	$6,759	$1,200	$9,084	$0.096	30	36%	280,411,808
4/27/19	5/28/19	87,972	359	$1,488	$7,236	$1,347	$10,071	$0.099	32	32%	300,160,464
TOTALS		1,276,431	961	$15,764	$89,549	$28,385	$133,698	$0.083	368	15%	4,355,182,572

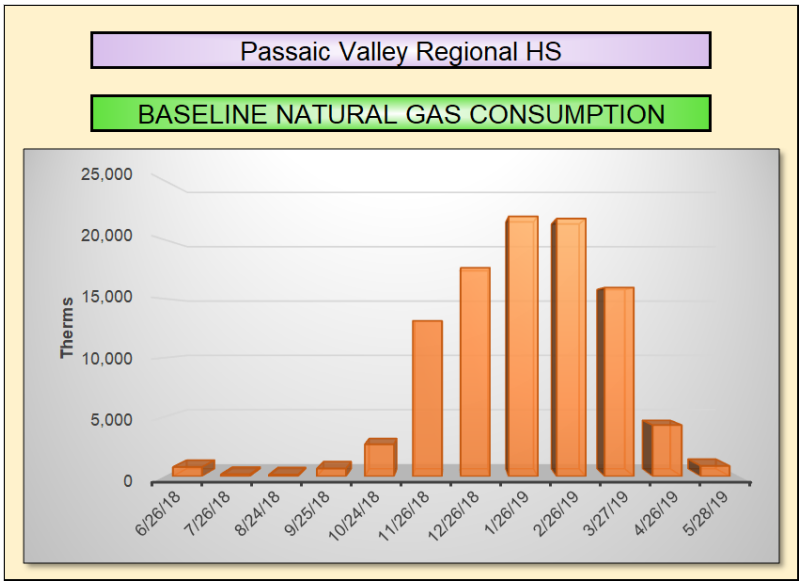
Passaic Valley Regional HS						ELECTRIC METER #2					
Provider:	PSE&G			7343285300				Meter #:	626106564		
Commodity:	Talen Energy			E Main St.				Rate Tariff:	General Lighting & Power		
Billing Period Start Date	Actual Reading	Usage kWh Net	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	$ / kWh Marginal Rate	Days	Load Factor	BTU
5/25/18	6/26/18	267	2	$9	$23	$22	$54	$0.119	33	19%	911,004
6/27/18	7/26/18	296	2	$10	$25	$27	$62	$0.118	30	19%	1,009,952
7/27/18	8/24/18	304	2	$10	$25	$23	$59	$0.116	29	23%	1,037,248
8/25/18	9/25/18	354	6	$11	$29	$37	$77	$0.114	32	8%	1,207,848
9/26/18	10/24/18	1,543	13	$23	$131	$55	$209	$0.100	29	18%	5,264,716
10/25/18	11/26/18	6,320	26	$98	$537	$51	$686	$0.100	33	31%	21,563,840
11/27/18	12/26/18	7,300	13	$117	$621	$50	$788	$0.101	30	79%	24,907,600
12/27/18	1/26/19	8,238	13	$136	$701	$50	$887	$0.102	31	87%	28,108,056
1/27/19	2/26/19	7,722	13	$129	$655	$50	$833	$0.101	31	82%	26,347,464
2/27/19	3/27/19	7,274	13	$121	$617	$50	$788	$0.101	29	82%	24,818,888
3/28/19	4/26/19	4,343	13	$80	$367	$50	$497	$0.103	30	47%	14,818,316
4/27/19	5/28/19	1,952	13	$44	$164	$51	$259	$0.107	32	20%	6,660,224
TOTALS		45,913	26	$788	$3,894	$518	$5,200	$0.102	369	20%	156,655,156

Passaic Valley Regional HS						ELECTRIC METER #3					
Provider:	PSE&G			7343285408				Meter #:	626044044		
Commodity:	Talen Energy			E main St.				Rate Tariff:	General Lighting & Power		
Billing Period Start Date	Actual Reading	Usage kWh Net	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	$ / kWh Marginal Rate	Days	Load Factor	BTU
6/1/18	7/2/18	312	1	$10	$25	$12	$48	$0.113	32	0%	0
7/3/18	8/1/18	298	1	$10	$25	$12	$47	$0.116	30	0%	0
8/2/18	8/31/18	364	7	$11	$30	$87	$128	$0.113	30	0%	0
9/1/18	10/2/18	466	7	$13	$39	$87	$138	$0.111	32	0%	0
10/3/18	10/30/18	468	7	$10	$40	$30	$80	$0.106	28	0%	0
10/31/18	11/30/18	470	14	$12	$40	$28	$79	$0.110	31	0%	0
12/1/18	1/2/19	459	1	$12	$39	$4	$55	$0.111	33	0%	0
1/3/19	1/31/19	424	1	$12	$37	$4	$53	$0.115	29	0%	0
2/1/19	3/2/19	231	1	$8	$16	$4	$29	$0.108	30	0%	0
3/3/19	4/4/19	211	1	$8	$15	$4	$27	$0.110	33	0%	0
4/5/19	5/2/19	310	1	$10	$23	$4	$37	$0.109	28	0%	0
5/3/19	6/3/19	324	1	$11	$24	$4	$39	$0.110	32	0%	0
TOTALS		4,337	14	$128	$354	$279	$760	$0.111	368	0%	0

Passaic Valley Regional HS						ELECTRIC METER #4					
Provider:	PSE&G			7343285505				Meter #:	226020125		
Commodity:	Talen Energy			E Main St.				Rate Tariff:	General Lighting & Power		
Billing Period Start Date	Actual Reading	Usage kWh Net	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
5/25/18	6/26/18	1,188	3	$27	$99	$35	$161	$0.136	33	0%	0
6/27/18	7/26/18	636	2	$16	$53	$23	$93	$0.146	30	0%	0
7/27/18	8/24/18	660	2	$17	$55	$25	$96	$0.146	29	0%	0
8/25/18	9/25/18	876	6	$21	$72	$40	$133	$0.152	32	0%	0
9/26/18	10/24/18	858	3	$15	$73	$15	$102	$0.119	29	0%	0
10/25/18	11/26/18	906	6	$18	$77	$13	$108	$0.119	33	0%	0
11/27/18	12/26/18	1,104	4	$22	$94	$14	$130	$0.117	30	0%	0
12/27/18	1/26/19	978	2	$20	$84	$7	$112	$0.114	31	0%	0
1/27/19	2/26/19	930	2	$20	$77	$7	$104	$0.112	31	0%	0
2/27/19	3/27/19	840	2	$18	$70	$8	$96	$0.114	29	0%	0
3/28/19	4/26/19	810	3	$19	$67	$10	$96	$0.118	30	0%	0
4/27/19	5/28/19	846	2	$22	$70	$8	$100	$0.118	32	0%	0
TOTALS		10,632	6	$235	$891	$205	$1,330	$0.125	369	0%	0

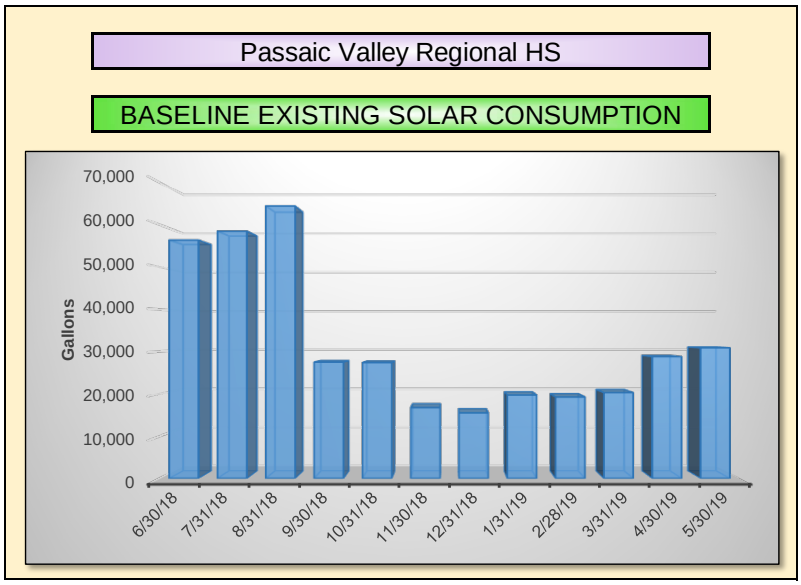
Passaic Valley Regional HS					ELECTRIC METER #5				
Provider:	PSE&G		737478800			Meter #:			
Commodity:	Talen Energy		Browertown Rd.			Rate Tariff:	Body Politic Lighting		
Billing Period Start Date	Actual Reading	Usage kWh Net	Electric Delivery Charges	Electric Commodity Charges	Total Electric Charges	Cost / kWh Checksum	Days	Load Factor	BTU
6/5/18	7/3/18	2,774	$469	$119	$588	$0.212	29	$0.00	0
7/4/18	8/2/18	2,977	$474	$122	$596	$0.200	30	$0.00	0
8/3/18	8/31/18	3,172	$479	$116	$596	$0.188	29	$0.00	0
9/1/18	10/2/18	4,008	$501	$133	$634	$0.158	32	$0.00	0
10/3/18	10/31/18	4,035	$501	$136	$637	$0.158	29	$0.00	0
11/1/18	12/3/18	5,057	$518	$199	$716	$0.142	33	$0.00	0
12/4/18	1/3/19	4,947	$516	$233	$749	$0.151	31	$0.00	0
1/4/19	2/1/19	4,533	$509	$218	$727	$0.160	29	$0.00	0
2/2/19	3/5/19	4,571	$510	$268	$778	$0.170	32	$0.00	0
3/6/19	4/3/19	3,735	$496	$188	$684	$0.183	29	$0.00	0
4/4/19	5/3/19	3,407	$498	$685	$1,183	$0.347	30	$0.00	0
5/4/19	6/4/19	3,248	$502	$184	$686	$0.211	32	$0.00	0
TOTALS		46,464	$5,972	$2,600	$8,573	$0.185	365	$0.00	0

Passaic Valley Regional HS											
TOTAL ELECTRIC											
Usage kWh	Demand kW	Electric Delivery Charges	Electric Commodity Charges	Electric Demand Charges	Total Electric Charges	Cost / kW Checksum	Cost / kWh Checksum	Total Cost / kWh Checksum	Days	Load Factor	BTU
112,292	400	$1,854	$366	$4,900	$6,532	$12.25	$0.020	$0.058	32	37%	383,140,304
102,190	319	$1,762	$315	$3,912	$5,394	$12.28	$0.020	$0.053	31	43%	348,672,280
89,591	262	$1,653	$7,263	$3,299	$11,620	$12.59	$0.100	$0.130	28	51%	305,684,492
144,712	961	$2,167	$11,769	$5,968	$19,271	$6.21	$0.096	$0.133	32	20%	493,757,344
111,088	428	$1,763	$9,207	$1,711	$12,044	$3.99	$0.099	$0.108	29	37%	379,032,256
120,780	686	$1,902	$10,039	$1,365	$12,589	$1.99	$0.099	$0.104	33	22%	412,101,360
133,184	326	$1,994	$11,137	$1,289	$13,672	$3.96	$0.099	$0.103	30	57%	454,423,808
130,570	416	$2,020	$10,739	$1,621	$13,654	$3.90	$0.098	$0.105	31	42%	445,504,840
128,691	330	$2,005	$10,578	$1,299	$13,104	$3.93	$0.098	$0.102	31	52%	439,093,692
125,283	343	$1,965	$10,295	$1,349	$12,925	$3.93	$0.098	$0.103	29	52%	427,465,596
91,054	320	$1,732	$7,901	$1,264	$9,714	$3.95	$0.106	$0.107	30	39%	310,676,248
94,342	359	$2,068	$7,678	$1,410	$10,469	$3.92	$0.103	$0.111	32	34%	321,894,904
1,383,777	961	$22,886	$97,288	$29,385	$140,987	$5.71	$0.0868	$0.1019	368	16%	4,721,447,124



Passaic Valley Regional HS					Natural Gas Meter #1		
Provider	PSE&G		Account #	4247204505	Meter #	1827740	
Commodity	PSE&G		Description	E Main St.	Rate Tariff:	Large Volume Gas	
Billing Period Start Date	Actual Reading	Therms	Gas Delivery Charges	Gas Commodity Charges	Gas Total Charges	$/Therm Marginal Rate	BTU
5/25/18	6/26/18	784	$175	$415	$590	$0.75	78,386,100
6/27/18	7/26/18	167	$121	$91	$212	$1.27	16,740,000
7/27/18	8/24/18	133	$118	$72	$191	$1.43	13,313,000
8/25/18	9/25/18	654	$164	$355	$519	$0.79	65,434,600
9/26/18	10/24/18	1,524	$242	$1,466	$1,708	$1.12	152,423,600
10/25/18	11/26/18	5,791	$2,088	$3,144	$5,232	$0.90	579,090,900
11/27/18	12/26/18	7,782	$2,399	$5,543	$7,942	$1.02	778,222,700
12/27/18	1/26/19	8,225	$2,665	$5,266	$7,930	$0.96	822,501,600
1/27/19	2/26/19	8,237	$2,683	$4,472	$7,155	$0.87	823,737,900
2/27/19	3/27/19	6,423	$2,366	$3,487	$5,853	$0.91	642,338,600
3/28/19	4/26/19	2,194	$272	$1,191	$1,464	$0.67	219,408,300
4/27/19	5/28/19	876	$190	$476	$665	$0.76	87,620,900
TOTALS		42,792	$13,483	$25,978	$39,461	$0.92	4,279,218,200

Passaic Valley Regional HS					Natural Gas Meter #2		
Provider	PSE&G		Account #	4247204505	Meter #	2589041	
Commodity	PSE&G		Description:	E Main St.	Rate Tariff:	Large Volume Gas	
Billing Period Start Date	Actual Reading	Therms	Gas Delivery Charges	Gas Commodity Charges	Gas Total Charges	Cost / Unit Checksum	BTU
5/25/18	6/26/18	0	$107	$0	$107	$0.00	0
6/27/18	7/26/18	0	$107	$0	$107	$0.00	0
7/27/18	8/24/18	0	$107	$0	$107	$0.00	0
8/25/18	9/25/18	0	$107	$0	$107	$0.00	0
9/26/18	10/24/18	1,177	$211	$639	$850	$0.72	117,659,900
10/25/18	11/26/18	7,334	$2,842	$3,981	$6,823	$0.93	733,362,900
11/27/18	12/26/18	9,818	$3,225	$6,995	$10,220	$1.04	981,794,800
12/27/18	1/26/19	13,714	$4,437	$8,775	$13,212	$0.96	1,371,389,000
1/27/19	2/26/19	13,518	$4,428	$7,339	$11,767	$0.87	1,351,784,700
2/27/19	3/27/19	9,509	$3,721	$5,163	$8,884	$0.93	950,930,200
3/28/19	4/26/19	2,126	$268	$1,154	$1,422	$0.67	212,597,800
4/27/19	5/28/19	0	$137	$0	$137	$0.00	0
TOTALS		57,195	$19,697	$34,046	$53,743	$0.94	5,719,519,300



Passaic Valley Regional HS					
Provider	Hudson Solar		Existing Solar PPA (kWh)		
Meter/Acct #	61833				
Billing Period Start Date	Actual Reading	Existing Solar PPA (kWh)	$$	Cost / Unit Checksum	BTU
6/1/2018	6/30/18	56,374	$4,063	$0.07	192,348,153
7/1/18	7/31/18	58,502	$4,216	$0.07	199,607,318
8/1/18	8/31/18	64,446	$4,645	$0.07	219,889,377
9/1/18	9/30/18	27,508	$1,983	$0.07	93,857,296
10/1/18	10/31/18	27,395	$1,974	$0.07	93,471,923
11/1/18	11/30/18	16,752	$1,207	$0.07	57,156,740
12/1/18	12/31/18	15,501	$1,117	$0.07	52,890,526
1/1/19	1/31/19	19,712	$1,421	$0.07	67,258,743
2/1/19	2/28/19	19,248	$1,387	$0.07	65,673,459
3/1/19	3/31/19	20,297	$1,487	$0.07	69,253,210
4/1/19	4/30/19	28,796	$2,117	$0.07	98,251,031
5/1/19	5/30/19	30,897	$2,272	$0.07	105,420,753
TOTALS		385,427	27,889	$0.07	1,315,078,528

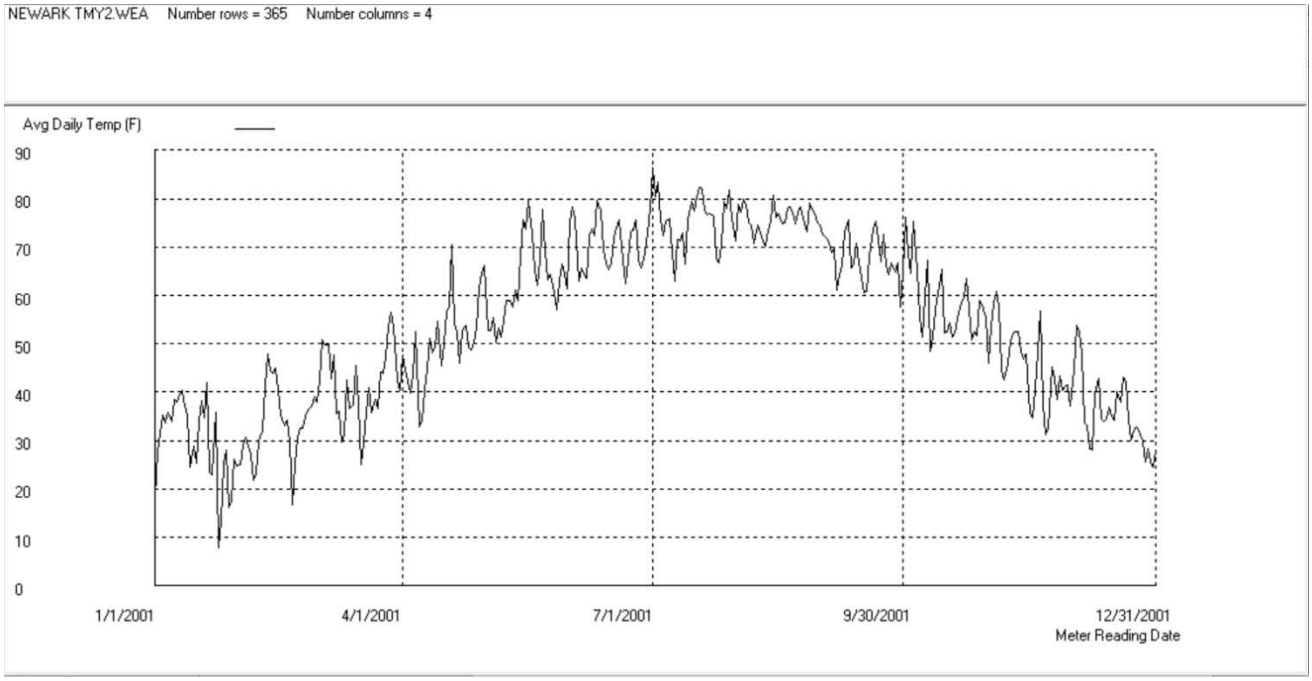
Energy Savings Utility Rates

DCO Energy used the following marginal rates to calculate energy cost savings:

CALCULATED UTILITY RATES - MARGINAL RATES USED FOR SAVINGS					
BUILDING/FACILITY	ELECTRIC			NATURAL GAS	Existing Solar PPA (kWh)
	$ / kW Oct. thru May	$ / kW June thru Sept.	$ / kWh Blended Rate	$ / Therm Marginal Rate	$ / Gal Marginal Rate
Passaic Valley Regional HS	$3.52	$9.31	$0.108	$0.93	$0.072

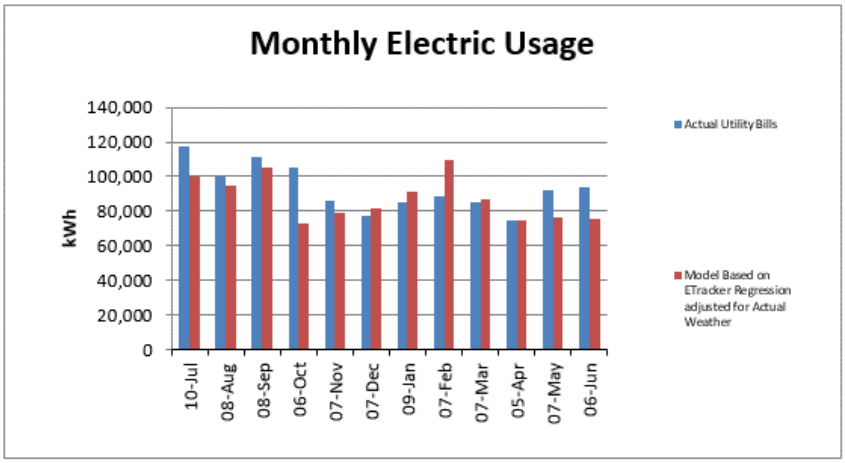
Passaic Valley Regional High School – Baseline Weather Data

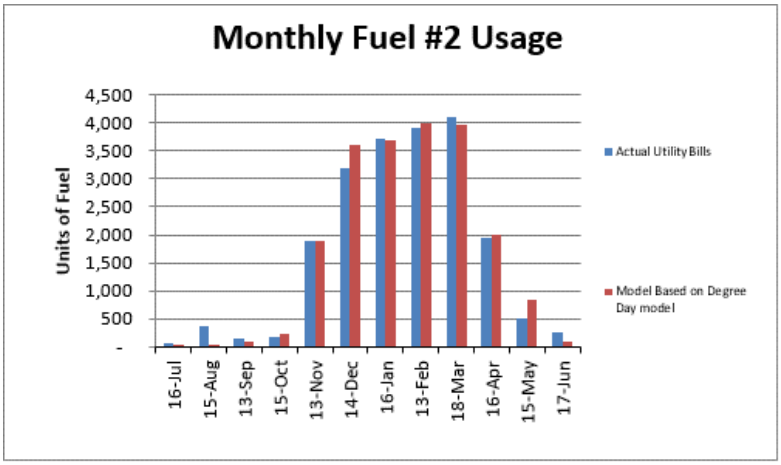
In accordance with the New Jersey Pay for Performance incentive program, TMY2 weather data was used for all weather normalized calculations and energy models utilizing weather data. The graph below represents the Newark TMY2 weather file used for the Passaic area.



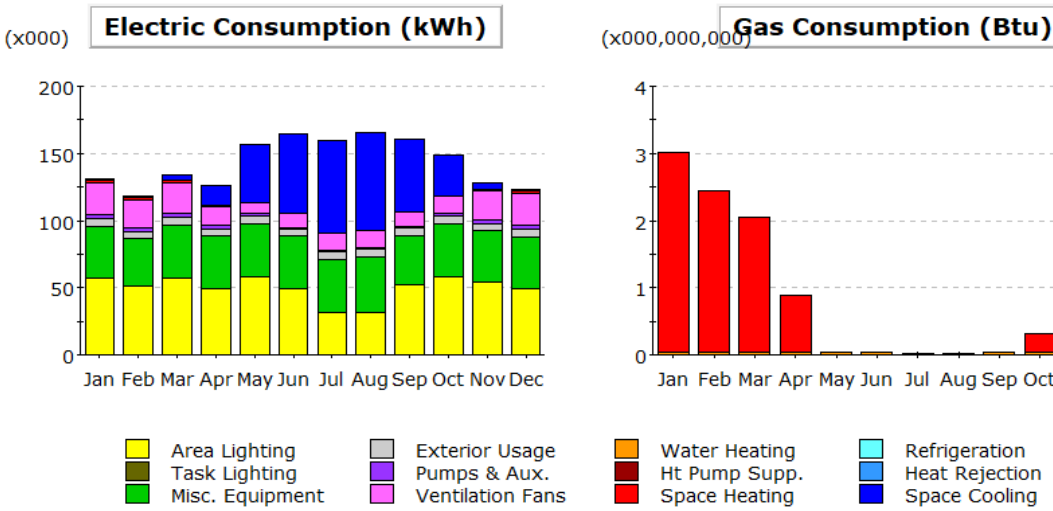
Passaic Valley Regional High School– Energy Modeling Baseline

Baseline energy use has been analyzed using eQuest energy simulation software. The New Jersey Pay for Performance incentive program requires +/- 5% accuracy when simulating baseline annual energy use. To calibrate the model, eTracker weather normalization software was used to establish the relationship between weather and energy use of each building. Shown below are the comparison charts and the modeling software baseline output reports. The reports show the model baseline produced by DCO Energy is within acceptable tolerances.





Below is the monthly energy consumption output for the baseline model.



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.6	1.0	4.2	14.8	43.2	58.7	69.7	72.6	54.6	30.9	4.0	1.5	356.0
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	2.1	1.8	1.7	0.7	-	-	-	-	-	0.3	1.4	1.9	9.9
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	23.4	20.9	22.7	14.1	8.5	10.5	12.2	12.8	10.4	12.4	21.5	23.0	192.4
Pumps & Aux.	3.2	2.9	3.1	2.3	1.3	1.1	1.1	1.1	1.1	1.9	2.9	3.2	25.1
Ext. Usage	5.7	5.2	5.7	5.5	5.7	5.5	5.7	5.7	5.5	5.7	5.5	5.7	67.5
Misc. Equip.	39.3	35.5	40.1	38.6	40.1	38.6	39.3	41.0	37.0	40.1	37.8	38.5	466.1
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	56.7	51.2	56.7	49.7	57.8	49.7	31.9	31.9	52.1	57.8	54.5	49.6	599.7
Total	131.0	118.6	134.2	125.9	156.8	164.2	160.0	165.2	160.7	149.2	127.7	123.4	1,716.6

Gas Consumption (Btu x000,000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	2.97	2.40	2.00	0.85	-	-	-	-	-	0.28	1.54	2.49	12.53
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.04	0.04	0.05	0.04	0.04	0.03	0.02	0.02	0.03	0.04	0.04	0.03	0.42
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	3.01	2.44	2.04	0.89	0.04	0.03	0.02	0.02	0.03	0.32	1.58	2.53	12.95

ENERGY SAVINGS PLAN

SECTION 3 – ENERGY CONSERVATION MEASURES

Energy Conservation Measure Breakdown by Building

The matrix below details which ECMs were applied and evaluated by building. It also indicates which ECMs were included in the project and which ECMs were not included in the project.

PASSAIC VALLEY REGIONAL HIGH SCHOOL ECM MATRIX

✔	ECM was evaluated
	ECM included in the project

ECM	ECM DESCRIPTION	Passaic Valley Regional HS
1	LED Lighting Replacement with Controls	✔
2	Energy Management System	✔
3	Demand Control Ventilation	✔
4	Solar PPA	✔
5	Unit Ventilator Replacement	✔
6	Rooftop Unit Replacement	✔
7	Air Handler Replacement	✔
8	Plug Load Controls	✔
9	Cathode TV Upgrade	✔
10	Destratification Fans	✔
11	Combined Heat & Power Unit	✔
12	Window Replacement	✔
13	Roof Renovations	✔
14	Building Envelope Improvements	✔
15	Steam Trap Replacement	✔
16	GPS Bi-Polar Ionization Air Cleaners	✔

ECM Breakdown by Cost & Savings

PASSAIC VALLEY REGIONAL HIGH SCHOOL		INCLUDED IN PROJECT	INSTALLED COST	ANNUAL ELECTRIC COST SAVINGS	ANNUAL NATURAL GAS COST SAVINGS	ANNUAL ENERGY COST SAVINGS	ANNUAL O&M COST SAVINGS	TOTAL ANNUAL COST SAVINGS	SIMPLE PAYBACK WITHOUT INCENTIVES
ECM	ENERGY CONSERVATION MEASURE	"Y" OR "N"	$	$	$	$	$	$	YEARS
1	LED Lighting Replacement with Controls	Y	$610,430	$43,717	($2,203)	$41,514	$3,055	$44,569	13.7
2	Energy Management System	Y	$475,000	$7,148	$17,272	$24,419	$13,329	$37,748	12.6
3	Demand Control Ventilation	Y	$25,194	$71	$16,379	$16,449	$0	$16,449	1.5
4	Solar PPA	N	$0	$0	$0	$0	$0	$0	0.0
5	Unit Ventilator Replacement	N	$0	$0	$0	$0	$0	$0	0.0
6	Rooftop Unit Replacement	N	$0	$0	$0	$0	$0	$0	0.0
7	Air Handler Replacement	N	$0	$0	$0	$0	$0	$0	0.0
8	Plug Load Controls	Y	$19,292	$1,545	$0	$1,545	$0	$1,545	12.5
9	Cathode TV Upgrade	N	$0	$0	$0	$0	$0	$0	0.0
10	Destratification Fans	N	$0	$0	$0	$0	$0	$0	0.0
11	Combined Heat & Power Unit	Y	$286,000	$11,409	($1,864)	$9,545	$0	$9,545	30.0
12	Window Replacement	N	$0	$0	$0	$0	$0	$0	0.0
13	Roof Renovations	N	$0	$0	$0	$0	$0	$0	0.0
14	Building Envelope Improvements	N	$0	$0	$0	$0	$0	$0	0.0
15	Steam Trap Replacement	Y	$13,520	$0	$1,354	$1,354	$0	$1,354	10.0
16	GPS Bi-Polar Ionization Air Cleaners	N	$0	$0	$0	$0	$0	$0	0.0
	TOTALS		$1,429,436	$63,889	$30,937	$94,827	$16,384	$111,211	12.9

PASSAIC VALLEY REGIONAL HIGH SCHOOL		INCLUDED IN PROJECT	ELECTRIC CONSUMPTION SAVINGS	ELECTRIC DEMAND SAVINGS	NATURAL GAS SAVINGS	TOTAL SITE ENERGY SAVINGS	TOTAL SOURCE ENERGY SAVINGS
ECM	ENERGY CONSERVATION MEASURE	"Y" OR "N"	kWh	kW	THERMS	MMBTU	MMBTU
1	LED Lighting Replacement with Controls	Y	392,146	147.6	-2,363	1,102	3,498
2	Energy Management System	Y	83,435	-1.5	18,529	2,138	2,743
3	Demand Control Ventilation	Y	58	1.0	17,571	1,757	1,845
4	Solar PPA	N	0	0.0	0	0	0
5	Unit Ventilator Replacement	N	0	0.0	0	0	0
6	Rooftop Unit Replacement	N	0	0.0	0	0	0
7	Air Handler Replacement	N	0	0.0	0	0	0
8	Plug Load Controls	Y	17,789	0.0	0	61	170
9	Cathode TV Upgrade	N	0	0.0	0	0	0
10	Destratification Fans	N	0	0.0	0	0	0
11	Combined Heat & Power Unit	Y	105,000	35.0	-2,000	158	793
12	Window Replacement	N	0	0.0	0	0	0
13	Roof Renovations	N	0	0.0	0	0	0
14	Building Envelope Improvements	N	0	0.0	0	0	0
15	Steam Trap Replacement	Y	0	0.0	1,452	145	152
16	GPS Bi-Polar Ionization Air Cleaners	N	0	0.0	0	0	0
	TOTALS		598,428	182.1	33,189	5,361	9,202

ECM Breakdown by Greenhouse Gas Reduction

PASSAIC VALLEY REGIONAL HIGH SCHOOL		INCLUDED IN PROJECT	Reduction of CO_2	Reduction of No_x	Reduction of SO_2	Reduction of Hg
ECM	ENERGY CONSERVATION MEASURE	"Y" OR "N"	LBS	LBS	LBS	LBS
1	LED Lighting Replacement with Controls	Y	568,415	351	867	1,824
2	Energy Management System	Y	343,608	250	184	388
3	Demand Control Ventilation	Y	18,612	162	0	0
4	Solar PPA	N	0	0	0	0
5	Unit Ventilator Replacement	N	0	0	0	0
6	Rooftop Unit Replacement	N	0	0	0	0
7	Air Handler Replacement	N	0	0	0	0
8	Plug Load Controls	Y	27,039	17	39	83
9	Cathode TV Upgrade	N	0	0	0	0
10	Destratification Fans	N	0	0	0	0
11	Combined Heat & Power Unit	Y	291,900	81	232	488
12	Window Replacement	N	0	0	0	0
13	Roof Renovations	N	0	0	0	0
14	Building Envelope Improvements	N	0	0	0	0
15	Steam Trap Replacement	Y	1,525	13	0	0
16	GPS Bi-Polar Ionization Air Cleaners	N	0	0	0	0
	TOTALS		1,251,099	874	1,323	2,784

Note:

- **Factors used to calculate Greenhouse Gas Reductions are as follows:**
  - ***CO2 = (1.52*kWh Savings) + (11.7*Therm Savings)***
  - ***NOx = (0.0028*kWh Savings) + (0.0092*Therm Savings)***
  - ***SO2 = (0.0065*kWh Savings)***
  - ***Hg = (0.0000000356* kWh Savings)***

ECM Budgeting Narrative

The budgetary costs carried in the project are based on good faith estimates, contractor supplied budgets for similar ECMs on other recent projects and a database of actual installed costs for various ECMs.

PASSAIC VALLEY REGIONAL HIGH SCHOOL		INCLUDED IN PROJECT	INSTALLED COST
ECM #	ENERGY CONSERVATION MEASURE	"Y" OR "N"	$
1	LED Lighting Replacement with Controls	Y	$610,430
2	Energy Management System	Y	$475,000
3	Demand Control Ventilation	Y	$25,194
4	Solar PPA	N	$0
5	Unit Ventilator Replacement	N	$0
6	Rooftop Unit Replacement	N	$0
7	Air Handler Replacement	N	$0
8	Plug Load Controls	Y	$19,292
9	Cathode TV Upgrade	N	$0
10	Destratification Fans	N	$0
11	Combined Heat & Power Unit	Y	$286,000
12	Window Replacement	N	$0
13	Roof Renovations	N	$0
14	Building Envelope Improvements	N	$0
15	Steam Trap Replacement	Y	$13,520
16	GPS Bi-Polar Ionization Air Cleaners	N	$0
	TOTALS		$1,429,436

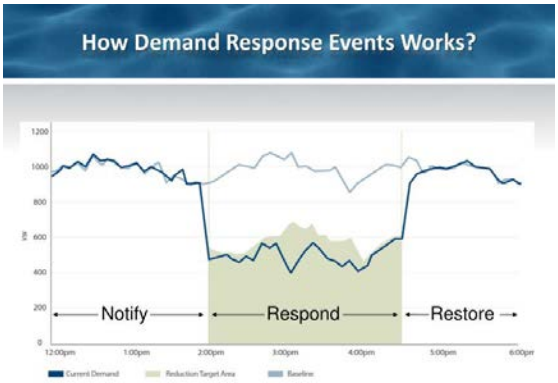
Demand Response & Project Incentives Analysis

Demand Response

Demand Response (DR) is a voluntary Pennsylvania-Jersey-Maryland (PJM) Interconnection program that allows end use customers to reduce their electricity usage during periods of higher power prices. In exchange, end-use customers are compensated through PJM members known as Curtailment Service Providers (CSPs) for decreasing their electricity use when requested by PJM. This program is available but does not apply to Passaic Valley Regional High School.

Common reduction strategies used in Demand Response include:

- Manual or automatic load drop
- Energy management systems
- Load shedding strategies
- Lighting control strategies
- Backup generation
- Ice storage systems



Benefits of the program include:

- Significant source of new revenue
- Helps to ensure local grid reliability
- Reduces the need for new environmentally taxing energy generation

In the base product, customers commit to reducing their load at the direction of PJM during emergency conditions during the summer months. In the Capacity Performance product, the customer will need to be able to reduce load when directed during the entire year.

SmartStart

The SmartStart Buildings Program offers incentives to upgrade many different technologies in your building. Equipment incentives are calculated based on type, efficiency, size, and application and are evaluated on a case-by-case basis. Starting October 1, 2020, enhanced incentives are now available for certain facilities. This program is available but does not apply to Passaic Valley Regional High School.

SmartStart Buildings Program

Prescriptive Lighting Application

FY21 October 1, 2020 – June 30, 2021

MEASURE DESCRIPTION

Prescriptive Lighting incentives are available for simple, one for one replacements of existing fixtures with most common interior and exterior LED bulbs, retrofit kits and fixtures in commercial and industrial facilities. Incentive rates are pre-determined based on the LED category type as listed by DesignLights Consortium or ENERGY STAR®. Ground up new construction and major renovations of existing buildings are not eligible for Prescriptive Lighting incentives and should pursue incentives using the Performance Lighting application. For fixtures that are ENERGY STAR® or DLC listed under a category not appearing on this application may be provided incentives through the SmartStart Custom application. Please contact us to discuss the Custom application as additional requirements apply.

	Design Lights Consortium® Qualified Products	Measure Code	Incentive Rate
LED TUBES	2' Linear Replacement Lamps (UL Type A, Type B, Type C)	PL1	$3/tube
	3' Linear Replacement Lamps (UL Type A, Type B, Type C)	PL2	$5/tube
	4' Linear Replacement Lamps (UL Type A, Type B, Type C)	PL3	$5/tube
	8' Linear Replacement Lamps (UL Type A, Type B, Type C)	PL4	$10/tube
	U-Bend Linear Replacement Lamps (UL Type A, Type B, Type C)	PL5	$5/tube

	Design Lights Consortium® Qualified Products	Measure Code	Incentive Rate
EXTERIOR LIGHTING	Architectural Flood and Spot Luminaires	PL27	$50/fixture
	Bollards	PL28	$50/fixture
	Fuel Pump Canopy Luminaires (*Includes new and Retrofit Kits*)	PL29	$100/fixture
	Landscape/Accent Flood and Spot	PL30	$25/fixture
	Outdoor Wall-Mounted Area Luminaires (*Includes Full-Cutoff, Non-Cutoff and Semi-cutoff*)	PL31	$50/fixture
	Outdoor Pole/Arm-Mounted Area and Roadway Luminaires (*Includes new and Retrofit Kits*)	PL32	$100/fixture
	Outdoor Pole/Arm-Mounted Decorative Luminaires (*Includes new and Retrofit Kits*)	PL33	$50/fixture
	Parking Garage Luminaires (Includes new and Retrofit Kits)	PL34	$100/fixture
	Large Outdoor Pole/Arm-Mounted Area and Roadway Retrofit	PL35	$150/fixture

Combined Heat & Power

One of the goals of the State of New Jersey is to enhance energy efficiency through on-site power generation with recovery and productive use of waste heat, and to reduce existing and new demands to the electric power grid. The Board of Public Utilities seeks to accomplish this goal by providing generous financial incentives for Combined Heat & Power (CHP) and Fuel Cell (FC) installations. This program is available but does not apply to Passaic Valley Regional High School.

Eligible CHP or Waste Heat to Power (WHP) projects must achieve an annual system efficiency of at least 60% (Higher Heating Value - HHV), based on total energy input and total utilized energy output. Mechanical energy may be included in the efficiency evaluation.

In order to qualify for incentives, systems must operate a minimum of 5,000 full-load equivalent hours per year (i.e. run at least 5,000 hours per year at full rated kW output). The Office of Clean Energy (OCE) may grant exceptions to this minimum operating hours requirement for Critical Facilities, provided the proposed system operates a minimum of 3,500 full-load equivalent hours per year and is equipped with blackstart and islanding capability. For this program, a Critical Facility is defined as any:

(a) public facility, including any federal, state, county, or municipal facility,

(b) non-profit and/or private facility, including any hospital, police station, fire station, water/wastewater treatment facility, school, multifamily building, or similar facility that:

(A) is determined to be either Tier 1 or critical infrastructure by the New Jersey Office of Emergency Management or the State Office of Homeland Security and Preparedness or

(B) could serve as a Shelter during a power outage. A Shelter is a facility able to provide food, sleeping arrangements, and other amenities to its residents and the community.

The CHP, FC, or WHP system must have a ten (10) year all-inclusive warranty. The warranty must cover the major components of the system eligible for the incentive, to protect against breakdown or degradation in electrical output of more than ten percent from the originally rated electrical output. The warranty shall cover the full cost of repair or replacement of defective components or systems, including coverage for labor costs to remove and reinstall defective components or systems. In the event the system warranty does not meet program requirements, customer must purchase an extended warranty or a ten (10) year maintenance/service contract. The cost of the ten (10) year warranty or service contract may

be considered as part of the cost of the project. Notwithstanding the foregoing, public entities that are prohibited from entering into agreements for the full ten (10) years may comply with the 10-year requirement by:

(a) providing an agreement for the longest lawful term,
(b) committing the entity to purchase an agreement for the remaining years, and
(c) either:
(i) providing the vendor's commitment for specific pricing for those remaining years, or
(ii) assuming the pricing for the remaining years will increase by 2.5% each year

Incentive Structure:

Eligible Technologies	Size (Installed Rated Capacity)	Incentive ($/kW)	% of Total Cost Cap per project[3]	$ Cap per project[3]
Powered by non-renewable or renewable fuel source, or combination[4]: Gas Internal Combustion Engine	≤500 kW	$2,000	30-40%[2]	$2 million
	>500 kW - 1 MW	$1,000		
Gas Combustion Turbine Microturbine	> 1 MW - 3 MW	$550	30%	$3 million
Fuel Cells with Heat Recovery (FCHR)	>3 MW	$350		
Fuel Cell without Heat Recover (FCwoHR)	Same as above(1)	Applicable amount above	30%	$1 million
Waste Heat to Power	≤ 1MW	$1,000	30%	$2 million
	> 1MW	$500		$3 million

Footnotes:

(1) Incentives are tiered, which means the incentive levels vary based upon the installed rated capacity, as listed in the chart above. For example, a 4 MW CHP system would receive $2.00/watt for the first 500 kW, $1.00/watt for the second 500 kW, $0.55/watt for the next 2 MW and $0.35/watt for the last 1 MW (up to the caps listed).

(2) The maximum incentive will be limited to 30% of total project. For CHP-FC projects up to 1 MW, this cap will be increased to 40% where a cooling application is used or included with the CHP system (e.g. absorption chiller).

(3) Projects will be eligible for incentives shown above, not to exceed the lesser of % of total project cost per project cap or maximum $ per project cap. Projects installing CHP or FC with WHP will be eligible for incentive shown above, not to exceed the lesser caps of the CHP or FC incentive. Minimum efficiency will be calculated based on annual total electricity generated, utilized waste heat at the host site (i.e. not lost/rejected), and energy input.

(4) Systems fueled by a Class 1 Renewable Fuel Source, as defined by N.J.A.C. 14:8-2.5, are eligible for a 30% incentive bonus. If the fuel is mixed, the bonus will be prorated accordingly. For example, if the mix is 60/40 (60% being a Class 1 renewable), the bonus will be 18%. This bonus will be included in the final performance incentive payment, based on system performance and fuel mix consumption data. Total incentive, inclusive of bonus, shall not exceed above stipulated caps.

(5) CHP or FC systems located at Critical Facility and incorporating blackstart and islanding technology are eligible for a 25% incentive bonus. This bonus incentive will be paid with the second/Installation incentive payment. Total incentive, inclusive of bonus, shall not exceed above stipulated caps.

Incentive Payment Schedule

The total incentive is divided into three partial payments. Each stage of payment requires additional documentation and/or has conditions that must be met. At approval, the maximum incentive partial payment amounts are calculated by multiplying the total incentive by the ratios listed in the following table.

Purchase	Installation	Acceptance of 12 months post-installation performance data
30%	50%	20%

(e.g., for the purpose of calculating a payback period)

Pay for Performance Incentives

The P4P Guidelines require that a building be over the threshold of 200 kW based on the 12 months of utility bills submitted with the application. P4P Incentives will be applied for at Passaic Valley Regional High School. The program incentive structure is as follows:

Incentive #1: Energy Reduction Plan			
Incentive Amount:		$0.15	per sq ft
Minimum Incentive:		$7,500	
Maximum Incentive:		$50,000	or 50% of facility annual energy cost
Incentive #2: Installation of Recommended Measures			
Minimum Savings Target:		**15%**	
Electric Incentives	Base Incentive based on 15% savings:	$0.09	per projected kWh saved
	For each % over 15% add:	$0.005	
	Maximum Incentive:	$0.11	
Gas Incentives	Base Incentive based on 15 % savings:	$0.90	per projected Therm saved
	For each % over 15% add:	$0.05	
	Maximum Incentive:	$1.25	
Incentive Cap:		**25%**	**of total project cost**
Incentive #3: Post-Construction Benchmarking Report			
Minimum Savings Target:		**15%**	
Electric Incentives	Base Incentive based on 15% savings:	$0.09	per actual kWh saved
	For each % over 15% add:	$0.005	
	Maximum Incentive:	$0.11	
Gas Incentives	Base Incentive based on 15% savings:	$0.90	per actual Therm saved
	For each % over 15% add:	$0.05	
	Maximum Incentive:	$1.25	
Incentive Cap:		**25%**	**of total project cost**

Enhanced Incentives are available for certain facility types as listed below:

- Commercial and Industrial
- Owned or operated by Municipalities
- Owned or operated by K-12 public schools
- Located within Urban Enterprise Zones (UEZ)

- Located within Opportunity Zones (OZ)

Enhanced incentives are equal to an additional 100% of the incentives #2 and #3 listed above. The incentives are subject to a cap of 80% of the Applicant's cost for the project allocated between Incentive #2 and #3:

Incentive #2: Installation of Recommended Measures			
Enhanced Incentives	Electric Savings Additional Incentive	$0.09-$0.11	per projected kWh saved
	Gas Savings Additional Incentive	$0.90-$1.25	per projected Therm saved
	Incentive Cap:	40%	of total project cost
Incentive #3: Post-Construction Benchmarking Report			
Enhanced Incentives	Electric Savings Additional Incentive	$0.09-$0.11	per actual kWh saved
	Gas Savings Additional Incentive	$0.90-$1.25	per actual Therm saved
	Incentive Cap:	40%	of total project cost

Incentive Calculations

Estimated incentive values were calculated in accordance with the New Jersey Clean Energy Program Guidelines. The total incentive amount was calculated to be $409,430 in rebates and incentives - 50% has been applied to the project financial analysis (See Section 4). Please see below, Appendix E and Appendix F for building-by-building details.

Incentive Totals

BUILDING	INCENTIVE TYPE	QUANTITY	UNITS	INCENTIVE $/UNIT	YEAR 1 INCENTIVE	YEAR 2 INCENTIVE	YEAR 3 INCENTIVE	YEAR 4 INCENTIVE	SUBTOTAL	TOTAL
PASSAIC VALLEY REGIONAL HIGH SCHOOL	P4P 2&3 (electric)	0	kWh	$0.44	$108,554	$108,554	$0	$0	$217,108	$409,430
	P4P 2&3 (natural gas)	0	therms	$5.00	$84,342	$84,342	$0	$0	$168,684	
	Energy Efficiency	182	kW	$32.45	$5,910	$5,910	$5,910	$5,910	$23,639	
				TOTALS	$198,805.54	$198,806	$5,910	$5,910	$409,430	

No implied and/or written guarantee is being made with respective to the receipt of incentives. All incentives estimates carry inherent risks that may jeopardize the receipt of them. Therefore, Passaic Valley Regional High School acknowledges and accepts that any project proposed should not rely on the receipt of incentives as a reason to implement it.

ECM 1 - LED Lighting Replacement with Controls

PASSAIC VALLEY REGIONAL HIGH SCHOOL ECM MATRIX		Passaic Valley Regional HS
✔	ECM was evaluated	
	ECM included in the project	
ECM	**ECM DESCRIPTION**	
1	LED Lighting Replacement with Controls	✔

Background & Existing Conditions

Lighting retrofits can greatly reduce energy consumption and lower energy bills, while maintaining lighting levels and quality by upgrading lighting components to more efficient and advanced technologies. Upgrading technologies can also offer employees greater control over lighting, allowing for additional energy savings.

Improvements in lighting technologies have led to increased lifetimes for components that will result in fewer failures and lengthen the time between maintenance activities.

The implementation of a routine maintenance program in addition to the lighting retrofit will greatly simplify the maintenance practices and reduce the operational costs.

Several new LED lighting lamp and fixture products are now available that were not viable a few years ago. While conventional HID fixtures are controlled only by photocell and timer technologies to turn either on and off, the use of LED fixtures and digital technology allows additional trimming and the use of motion/occupancy-based controls to limit the output of exterior fixtures when sufficient natural lighting is present or for periods when the parking lots and authority grounds are unoccupied.

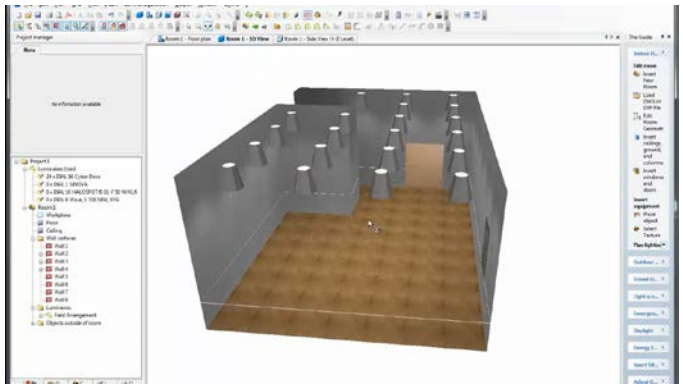
The replacement of existing fixture heads with premium efficiency / LED-based fixtures is the basis of this listed ECM.



Lighting Level Testing and Commissioning

Assuring that the lighting levels of the interior and exterior spaces are a critical component of lighting retrofit project. Each space being retrofitted will have lighting levels measured and recorded during the design phase of the project.

The lighting system will be designed to assure that the lighting levels meet code and either meet or exceed the existing levels. Lighting measurements will be taken per IES Standards.



When the retrofit has been completed, the lighting levels in each space will be measured again to assure compliance with the system design. All documentation will be delivered to Passaic Valley Regional High School for approval and record.

Existing interior lighting at Passaic Valley Regional High School

Scope of Work

- Retrofit the existing fixtures with new LED Bulbs.
  - Disconnect power at the breaker panel for the existing fixture circuit
  - Remove and dispose of existing bulbs and ballasts in a responsible manner
  - Install new ballast
  - Install new sockets (as necessary)
  - Install new bulbs
  - Test new fixture for operation and performance
  - Test existing space for proper lighting levels

- All Retrofit Components will be UL Listed
- Bid documents will call for UL Inspection of each retrofitted fixture

ECM Calculations

Energy Savings from the installation of new LED lighting is based on the reduction in electric power (Watts) from the existing bulbs/fixtures to new LED bulbs/fixture and were modeled using eQuest. The spreadsheet calculations below were entered into the eQuest models to determine energy savings. eQuest also accounts for HVAC cooling savings and heating increase from the reduction in lighting loads. A 57% coincidence factor was applied to the model demand savings to account for unknowns associated with estimating building peak demand. The simulation results from the LED Lighting Replacement are shown below. Please see Appendix F for Lighting Line by Lines.

ENERGY MODELING OUTPUTS

LED Lighting Replacement Savings

BUILDING	SQFT	MODEL % DEMAND SAVINGS	COINCIDENCE FACTOR	INTERACTIVE FACTOR	kW Savings	MODEL % ELECTRIC SAVINGS	kWh SAVINGS	MODEL % THERM SAVINGS	THERM SAVINGS
Passaic Valley Regional HS	248,607	27.0%	57%	0%	148	28.3%	392,146.0	-2.4%	(2,363)

ECM 2/3 - Energy Management System

PASSAIC VALLEY REGIONAL HIGH SCHOOL ECM MATRIX		Passaic Valley Regional HS
✓	ECM was evaluated	
	ECM included in the project	
ECM	**ECM DESCRIPTION**	
2	Energy Management System	✓
3	Demand Control Ventilation	✓

Background & Existing Conditions

Energy Management Systems (EMS) are systems comprised of sensors, operators, processors, and a front-end user interface that controls and monitors electrical and mechanical building systems. Such systems provide automated control and monitoring of the heating, cooling, ventilation, lighting and performance of a building or group of buildings.

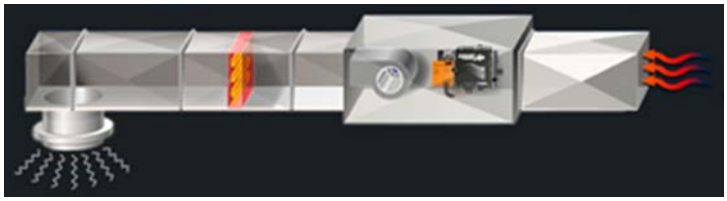
Web Based Building Automation Interface

Having building systems monitored from a central location enables the operator to receive alerts and predict future problems or troublesome conditions. The data obtained from these can be used to produce a trend analysis and annual consumption forecasts. Advanced control strategies implemented using these systems such as time scheduling, optimum start and stop, night set-back, demand-controlled ventilation, and peak demand limiting. The auditor will be able to use the EMS to diagnose current building system problems as well as tailor specific energy savings strategies that utilize the full capability of the given EMS.

The new EMS will remove existing Automated Logic controllers and software and replace with new open protocol controls. Control strategies will be designed and programmed into the

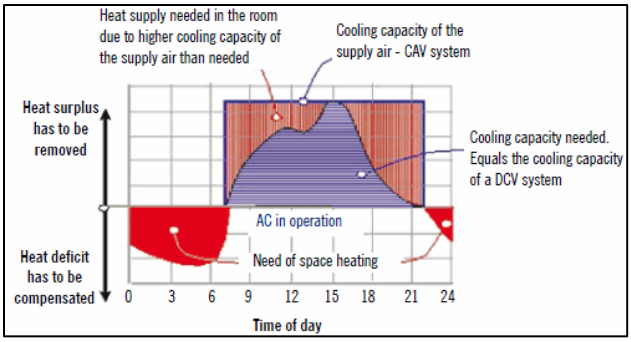
system to maintain building comfort while operating the building mechanical system in the most efficient manner possible. Strategies include:

1. Occupancy Scheduling
2. Building Wide Night Set Back
3. Morning Warm Up
4. Individual Room Temperature Set Point Control
5. Supply Air Temperature Reset
6. Heating Supply Water Temperature Resets
7. Economizer Control
8. CO2 Ventilation Control



Demand Control Ventilation - Background & Existing Conditions

In most commercial occupancies, ventilation is provided to deal with two types of indoor pollution: (1) odors from people, and (2) off-gassing from building components and furniture. When a space is vacant, it has no people pollution, so the people-related ventilation rate is not needed. Many types of high-occupancy spaces, such as classrooms, multipurpose rooms, theaters, conference rooms, or lobbies have ventilation designed for a high peak occupancy that rarely occurs. Ventilation can be reduced during the many hours of operation when spaces are vacant or at lower than peak occupancy. When ventilation is reduced, building owners or operators save energy because it is not necessary to heat or cool as much outside air. In colder climates, heating for ventilation air is greater and DCV saves the most energy.

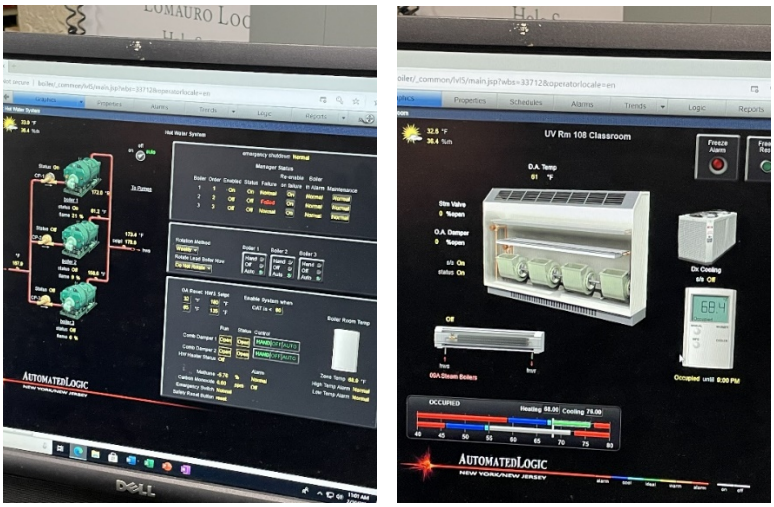


Building	Name	Area Served	Quantity	Type	Existing DCV
Passaic Valley Regional High School	RTU-1	Auditorium	2	Single Zone	No

Demand Control Ventilation Operation

The objective of a CO2 control strategy is to modulate ventilation to maintain target cfm/person ventilation rates based on actual occupancy. The strategy should allow for reduced overall ventilation during periods of less than full occupancy which will save energy. Typical control approaches have used a proportional or proportional-integral control algorithm to modulate ventilation between a base ventilation rate established for non-occupant-related sources and the design ventilation rate for the space. Typically, modulation of outside air above base ventilation begins when indoor CO2 is 100 ppm above outside levels and continues until the target CO2 levels are reached and the design ventilation rate is provided.

Duct sensors are best used where a single space or multiple spaces with common occupancy patterns are being ventilated. An example of this approach would be to place a sensor in the return duct of an air handler that serves multiple classrooms, using an upper limit set point of 500 or 600 ppm CO2 above ambient (instead of 700 ppm). Polarized-media electronic air cleaners can allow for the upper CO2 limit to be raised to 1,500 ppm. This approach works best when the AHU system is serving spaces that are occupied with very similar schedules and rates.



Existing Conditions at Passaic Valley Regional High School

Scope of Work –Energy Management System

This measure involves replacing the existing control system with an open-protocol, web-based Energy Management system. The proposed energy management system will be able to vary the operation of the unit, outdoor air damper, space temperature set points, and air

conditioning systems (if applicable). This will include zone scheduling, temperature setback and unoccupied outdoor air shut off. The building will be provided with electric and natural gas submetering for continuous monitoring and reporting of building energy consumption via Energy Dashboards.

A more specific scope of work includes:

- Building Automation Systems shall be accessible via the Internet.
- User shall have the ability to view the system graphics, change set points, perform overrides, view schedules, change schedules, view alarms, acknowledge alarms, view trend information as well as print, save & e-mail trend information.
- A Secure Internet Connection to the School Network shall be provided and managed by the School IT Department.
- 3-D Graphics Package will be provided for navigating the Building Automation System as well as viewing floor plans, system graphics and equipment graphics.

Remote access and mobile interface

- An Energy Monitoring Dashboard will be provided to display and report Gas & Electrical Consumption for each building detailed in this proposal.
- The School Facilities and IT Staff will receive full training on the operation of the system.
- Portable tablets will be provided for remote and mobile BAS Interface.
- All Automated Logic controllers will be removed.
- New open protocol controllers will be installed.

ECM Calculations

Energy Savings from the installation of a School Wide Energy Management System were modeled using eQuest. The simulation results are shown below.

ENERGY MODELING OUTPUTS

Energy Management System Savings

BUILDING	MODEL % ELECTRIC SAVINGS	kWh SAVINGS	MODEL % DEMAND SAVINGS	kW SAVINGS	MODEL % THERM SAVINGS	MAX % HEATING SAVINGS	THERM SAVINGS	ENERGY COST SAVINGS
Passaic Valley Regional HS	6.0%	83,435	-0.2%	(2)	18.5%	30.0%	18,529	$24,518

ENERGY MODELING OUTPUTS								
DCV Savings								
BUILDING	**MODEL % ELECTRIC SAVINGS**	**kWh SAVINGS**	**MODEL % DEMAND SAVINGS**	**kW SAVINGS**	**MODEL % THERM SAVINGS**	**MAX % HEATING SAVINGS**	**THERM SAVINGS**	**ENERGY COST SAVINGS**
Passaic Valley Regional HS	0.004%	58	0.104%	1	17.573%	30.0%	17,571	$16,384

Note:

- See existing and proposed temperature, fan and DCV schedules in Appendix H. In general, the existing temperatures had no setbacks. This ECM sets the building temperature back at 9pm during the week and sets the minimum ventilation to 5% of supply air when the spaces are unoccupied. The existing building temperature set points, setbacks and design ventilation rates are unchanged.

ECM 4 - Solar Power Purchase Agreement

PASSAIC VALLEY REGIONAL HIGH SCHOOL ECM MATRIX		Passaic Valley Regional HS
✓	ECM was evaluated	
	ECM included in the project	
ECM	ECM DESCRIPTION	
4	Solar PPA	✓

ECM WAS EVALUATED BUT WAS NOT INCLUDED IN THE ESIP PROJECT

Background & Existing Conditions

The renewable energy industry is one of the fastest growing and evolving components to modern building system design. The ability to capture solar energy will provide long term economic and environmental benefits. Technology improvements are rapidly evolving as well, and the market is flooded with new products with new features that have only been available within the last few years, with promising new technologies and updates on the verge of becoming available to the market.

Photovoltaic (PV) solar array

Clients have the opportunity to purchase power through a Power Purchase Agreement, predetermining fixed low rates for the duration of the agreement, without having to manage any part of the process. This allows the solar provider to manage compliance reporting, filings, and maintenance of the equipment for the entire length of the contract.

A solar PPA makes going green easy. Work takes place around the client's schedule, and a safe and functional environment is maintained throughout installation of the system.

Assessment

A preliminary assessment of your facilities will allow for the design of a system that meets your energy needs and environmental goals.

Agreement

Power Purchase Agreements allow for the sale of the energy produced on a per kWh basis, while a lease agreement allows the solar provider to access the system they own so that they may monitor and maintain the system for you.

Installation

A turnkey system includes the design, construction, commissioning, and interconnection with local utilities.

Monitoring

The solar provider monitors the PV installation to ensure performance and for ease of billing. The client has the capability to track output and environmental benefits online.

Management

The solar provider handles all compliance and reporting requirements for the client. They will file documentation with federal and state agencies and participate in state and utility REC markets.

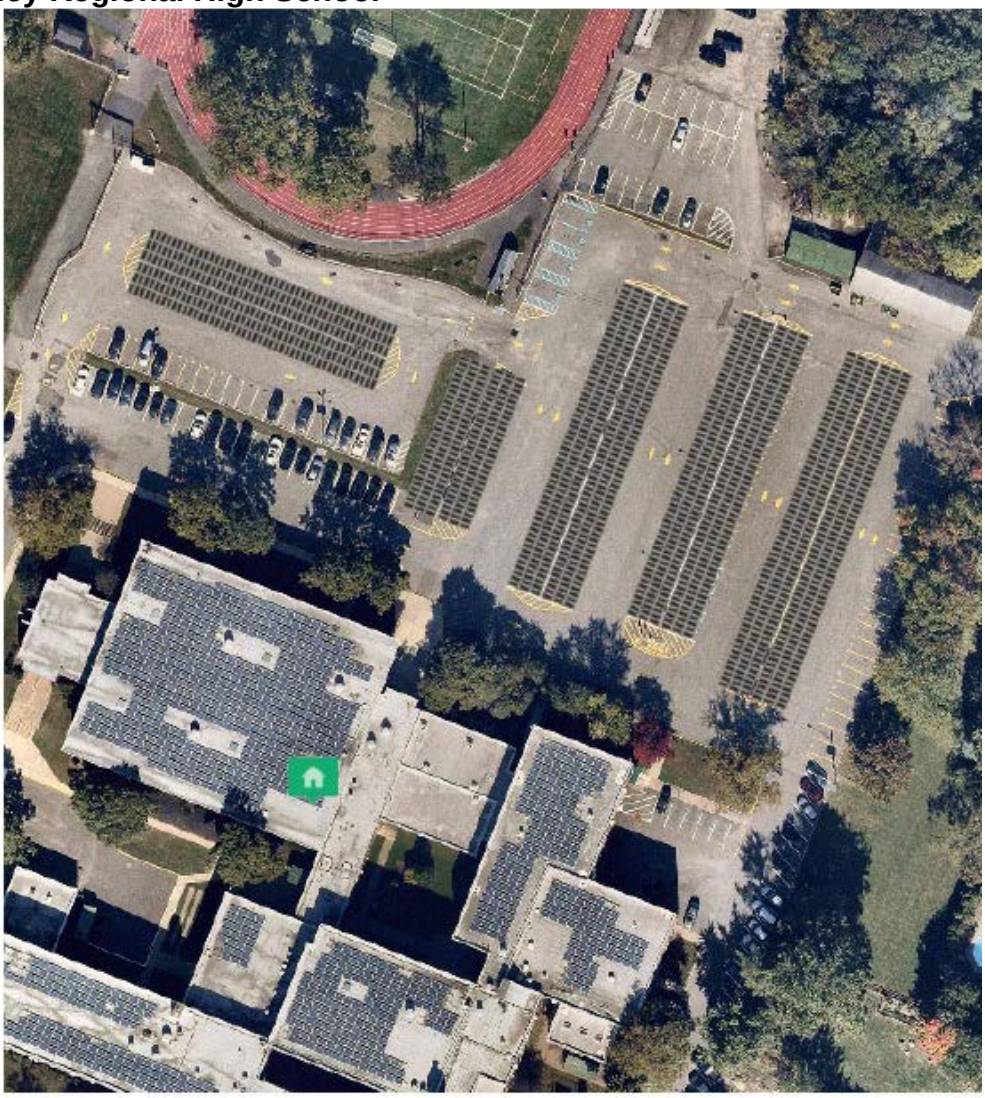
Scope of Work

- Savings estimates are calculated from current market estimates of the Solar PPA rate.
- Installation of the Solar PV System shall be in accordance with NFPA 70. NEC 2011. ARTICLE 690.Solar Photovoltaic (PV) Systems.
- PPA Firm will receive any incentives available

Solar Photovoltaic Arrays

Passaic Valley Regional High School solar array opportunities are shown below:

Passaic Valley Regional High School



ECM Calculations

The energy savings shown below are a result of the reduced electrical cost from the PPA for the kWh generated by the solar panels. Actual rates and solar generation estimates were taken from the proposals based on the current conditions of the solar market. A comparison was done to ensure the generated kWh did not exceed the post-project estimated energy consumption. In cases where the generated kWh exceeded the post-project electrical consumption, the generation numbers were reduced to ensure the site would not generate more electric than it consumes. The PPA term is 15 years.

PPA RATE ($/kWh)	ANNUAL ESCALATION RATE	ANNUAL PANEL DERATING	PPA CONTRACT TERM (YRS)	END OF PPA REMOVAL COST
$0.0800	2.00%	0.10%	15	$0

INSTALLED CAPACITY (kWdc)	REQ'D ROOFING UPGRADES	TOTAL ECM YEAR 1 SAVINGS
610	$0	$16,246

Solar PPA - Rates & Savings

BUILDING	SQFT	INSTALLED kWh GENERATION	POST ESIP MAX SOLAR kWh GENERATION	$$/kWh RATES		SAVINGS	TOTAL SAVINGS
				UTILITY	NEW PPA		
Passaic Valley Regional HS	248,607	0	785,349	$0.102	$0.0800	$16,246	$16,246

YEAR	PPA kWh PRODUCTION	UTILITY SAVINGS	EXISTING PPA SAVINGS	PPA COST	NET SOLAR SAVINGS
1	742,290	$75,629	$0	$59,383	$16,246
2	741,548	$77,215	$0	$60,510	$16,705
3	740,806	$78,835	$0	$61,659	$17,176
4	740,065	$80,489	$0	$62,829	$17,660
5	739,325	$82,177	$0	$64,022	$18,156
6	738,586	$83,901	$0	$65,237	$18,665
7	737,847	$85,661	$0	$66,475	$19,187
8	737,110	$87,458	$0	$67,737	$19,722
9	736,372	$89,293	$0	$69,022	$20,271
10	735,636	$91,166	$0	$70,332	$20,834
11	734,900	$93,079	$0	$71,667	$21,412
12	734,166	$95,031	$0	$73,027	$22,004
13	733,431	$97,025	$0	$74,413	$22,612
14	732,698	$99,060	$0	$75,826	$23,235
15	731,965	$101,138	$0	$77,265	$23,873

Passaic Valley Regional HS							
YEAR	$$/kWh RATES			SOLAR kWh	UTILITY SAVINGS	PPA COST	TOTAL SAVINGS
	UTILITY	SOLAR PPA	MAINT.				
1	$0.102	$0.0800	$0	742,290	$75,629	$59,383	$16,246
2	$0.104	$0.0816	$0	741,548	$77,215	$60,510	$16,705
3	$0.106	$0.0832	$0	740,806	$78,835	$61,659	$17,176
4	$0.109	$0.0849	$0	740,065	$80,489	$62,829	$17,660
5	$0.111	$0.0866	$0	739,325	$82,177	$64,022	$18,156
6	$0.114	$0.0883	$0	738,586	$83,901	$65,237	$18,665
7	$0.116	$0.0901	$0	737,847	$85,661	$66,475	$19,187
8	$0.119	$0.0919	$0	737,110	$87,458	$67,737	$19,722
9	$0.121	$0.0937	$0	736,372	$89,293	$69,022	$20,271
10	$0.124	$0.0956	$0	735,636	$91,166	$70,332	$20,834
11	$0.127	$0.0975	$0	734,900	$93,079	$71,667	$21,412
12	$0.129	$0.0995	$0	734,166	$95,031	$73,027	$22,004
13	$0.132	$0.1015	$0	733,431	$97,025	$74,413	$22,612
14	$0.135	$0.1035	$0	732,698	$99,060	$75,826	$23,235
15	$0.138	$0.1056	$0	731,965	$101,138	$77,265	$23,873
				11,056,746	1,317,161	1,019,404	297,756

ECM 5 - Unit Ventilator Replacement

PASSAIC VALLEY REGIONAL HIGH SCHOOL ECM MATRIX		Passaic Valley Regional HS
✔	ECM was evaluated	
	ECM included in the project	
ECM	**ECM DESCRIPTION**	
5	Unit Ventilator Replacement	✔

ECM WAS EVALUATED BUT WAS NOT INCLUDED IN THE ESIP PROJECT

Background & Existing Conditions

Superior indoor air quality can help ensure a healthier and higher performance learning environment for students and staff, and the choice of ventilation equipment plays a big role in the quality of the indoor air. Proper ventilation with outdoor air is a key component for good indoor air quality in schools and classrooms since indoor air may be two to five times more polluted than outdoor air, and there are large populations of children who may be more susceptible to indoor pollutants than the general population. The high occupant densities of schools and classrooms often makes it challenging for building designers to incorporate ventilation systems that provide adequate outdoor ventilation air (in compliance with the industry's ventilation standard, ASHRAE 62-2013), while providing buildings with good indoor air quality and minimized costs.

High efficiency unit ventilator


Existing unit ventilators at Passaic Valley Regional HS

Scope of Work

- Coordinate installation time and duration to ensure operations are unaffected
- Remove and properly dispose of existing unit ventilators
- Ensure wall penetration for outdoor air intake is large enough for ventilation compliant with code (may require masonry work and new shelving to accommodate larger louver)
- Install new hot water supply/return piping
- Install new unit ventilators with new hot water modulating valves, hot water coils and DDC controllers per manufacturer's specifications
- Installation test and functional check

ECM Calculations

Energy Savings from the installation of unit ventilators were modeled using eQuest. The simulation results are shown below.

ENERGY MODELING OUTPUTS					
Unit Ventilator Replacement Savings					
BUILDING	SQFT	MODEL % ELECTRIC SAVINGS	kWh SAVINGS	MODEL % THERM SAVINGS	THERM SAVINGS
Passaic Valley Regional HS	248,607	0.9%	12,985	-0.3%	(259)

Energy Savings and Financial Impact

Please see the Energy Savings and Financial Impact Appendix at the end of this section.

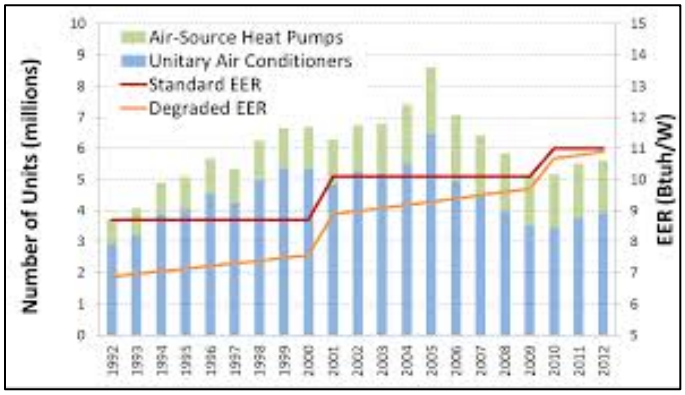
ECM 6 - Rooftop Unit Replacement

PASSAIC VALLEY REGIONAL HIGH SCHOOL ECM MATRIX		Passaic Valley Regional HS
✔	ECM was evaluated	
	ECM included in the project	
ECM	**ECM DESCRIPTION**	
6	Rooftop Unit Replacement	✔

ECM WAS EVALUATED BUT WAS NOT INCLUDED IN THE ESIP PROJECT

Background & Existing Conditions

Many commercial buildings are operating with older and inefficient HVAC systems. The average life expectancy of commercial HVAC RTU equipment is 10 to 15 years—which means that many commercial buildings are ready for new natural gas rooftop units. Technology improvements and demand have led to greater energy efficiency and more choices in systems. Installing new, higher efficiency units will provide energy savings as well as deliver enhanced technology and controls of the RTUs when compared to the existing units.



Existing RTUs at Passaic Valley Regional High School

Scope of Work

Install new packaged rooftop units.

- Conduct through structural integrity if roof or dunnage mounted equipment
- Conduct integrity test of pad mounted equipment
- Repair or replace structural system for new roof mounted equipment
- Coordinate installation time and duration to ensure operations are unaffected
- Develop site crane plan for all lifts required
- Set adapter curbs (if required)
- Lift (or set) new RTUs into place
- Ensure any flashing is properly sealed to roof structure
- Connect new ductwork transitions
- Connect electrical system to new HVAC
- Provide new DDC controls for HVAC system
- Start-up of HVAC of equipment by manufacturer
- Provide efficiency test of new system
- Test and commission new HVAC system
- Note:
    - Cost of new DDC Controls for RTU is carried in ECM #2

ECM Calculations

Energy Savings from the installation of rooftop units were modeled using eQuest. The simulation results are shown below.

ENERGY MODELING OUTPUTS							
RTU Replacement Savings							
BUILDING	**SQFT**	**MODEL % ELECTRIC SAVINGS**	**kWh SAVINGS**	**MODEL % DEMAND SAVINGS**	**kW SAVINGS**	**MODEL % THERM SAVINGS**	**THERMS SAVINGS**
Passaic Valley Regional HS	248,607	0.1%	1,058	0.3%	3	0.00%	0

Energy Savings and Financial Impact

Please see the Energy Savings and Financial Impact Appendix at the end of this section.

ECM 7 - Air Handling Unit Replacement

PASSAIC VALLEY REGIONAL HIGH SCHOOL ECM MATRIX		Passaic Valley Regional HS
✔	ECM was evaluated	
	ECM included in the project	
ECM	ECM DESCRIPTION	
7	Air Handler Replacement	✔

ECM WAS EVALUATED BUT WAS NOT INCLUDED IN THE ESIP PROJECT

Background & Existing Conditions

Over time the casings of air handlers will rust which could lead to excess air leakage into the mechanical room they are located in. The mechanical rooms that house air handlers were not designed to be conditioned but it was evident that the leakage of the air handlers was conditioning the spaces. Old air handlers are susceptible to oxidation and particulate build-up on the coils. Since heat transfer occurs on the fins of the coils it is important to keep them clean and rust-free, especially when serving a very humid space such as a pool. However, when equipment ages the build-up of the deposits is inevitable when the unit approaches the ASHRAE useful life of 20 years.

Air handling unit

Variable frequency drives (VFDs) can produce many benefits for Air handlers, Roof Top units and Energy Recovery Units. The benefits include energy consumption reduction, reduced energy costs, lower sound levels produced by a slower fan tip speed, and reduced maintenance due to the extended life of the drive components. The installation of a VFD will allow the supply and return fans in HVAC systems to modulate based on the required amount airflow needed to maintain the necessary temperature for a specific conditioned space.

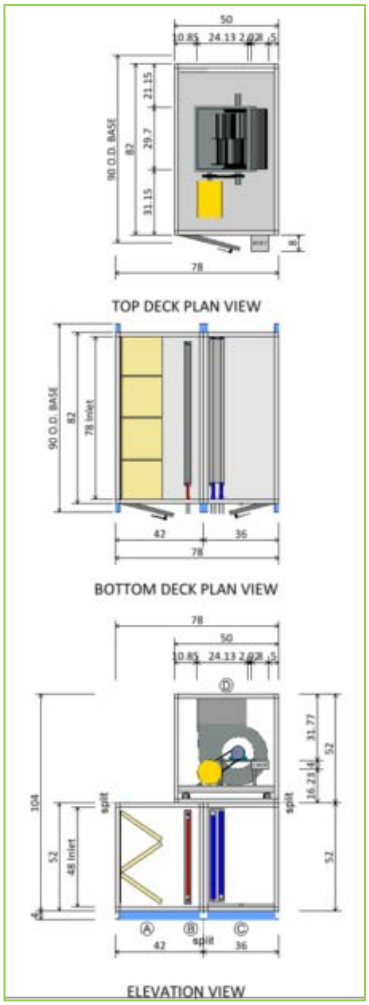
An air-side economizer is a duct/damper arrangement in an air-handling unit that allow an AHU to use outdoor air to reduce or eliminate the need for mechanical cooling. When there is a need for cooling and if the outdoor-air conditions are favorable for economizing (outdoor-air

temperature is less than return-air temperature), unconditioned outdoor-air can be used to meet all the cooling energy needs or supplement mechanical cooling.

Existing AHU located in the Wrestling gym at Passaic Valley Regional HS

Scope of Work

- Demolish existing Air Handling Unit
  - Disconnect power
  - Disconnect existing steam piping
  - Disconnect existing supply and outside air ductwork
  - Remove existing Exhaust Fans and associated ductwork
  - Remove existing control panels and control accessories
- Furnish and Install new Air Handling Unit to replace the existing unit. In general, new Air Handling Unit to have the following:
  - Mixing Box
  - Filter
  - Steam Heating Coil
  - Supply Fan
- Reconnect existing supply ductwork to the new unit
- Connect existing return and exhaust ductwork to new unit
- Reconnect existing steam piping to the new unit
- Note:
  - Cost of new DDC Controls for AHU is carried in ECM #2



ECM Calculations

Energy Savings from the installation of the air handling unit was modeled using eQuest. The simulation results are shown below.

ENERGY MODELING OUTPUTS							
RTU Replacement Savings							
BUILDING	**SQFT**	**MODEL % ELECTRIC SAVINGS**	**kWh SAVINGS**	**MODEL % DEMAND SAVINGS**	**kW SAVINGS**	**MODEL % THERM SAVINGS**	**THERMS SAVINGS**
Passaic Valley Regional HS	248,607	0.0%	214	0.0%	0	-0.01%	(9)

Energy Savings and Financial Impact

Please see the Energy Savings and Financial Impact Appendix at the end of this section.

ECM 8 - Plug Load Controls

PASSAIC VALLEY REGIONAL HIGH SCHOOL ECM MATRIX		Passaic Valley Regional HS
✔	ECM was evaluated	
	ECM included in the project	
ECM	**ECM DESCRIPTION**	
8	Plug Load Controls	✔

Background & Existing Conditions

Plug load controllers are smart devices communicating on a wireless network that can be controlled via any web-enabled device. The system allows scheduling of individual, groups, or all pug load controllers to eliminate unnecessary energy use.

Plug load controllers with Wi-Fi capability

Office spaces having numerous copier/printers with standard operating hours are ideal locations for plug controllers. For example, consider an office building that is open weekdays from 7 am to 6 pm and closed on the weekends. A plug load management system can automatically shut off power to devices like computer monitors, printers and vending machines when the office building is not open, reducing energy use by over 60%.

Existing plug load including Window ACs and Printers

Scope of Work

- Plug load controllers will be installed on viable electronic equipment.
- Connect plug load controllers via the existing WiFi network in each school.

ECM Calculations

Energy savings from the installation of plug load controllers were calculated using existing standby power draw and the number of hours the plug load controller will turn the equipment completely off. The plug load controller will turn the equipment off using a user programmed schedule, saving the energy from the standby power draw. Savings calculations and scope of work can be seen below.

Plug Load Management Opportunities Savings

BUILDING	SQFT	kWh SAVINGS	THERMS SAVINGS
Passaic Valley Regional HS	248,607	17,789	

Plug Load Controller Savings

BUILDING NAME	Device Type	Plug Load Type	Quantity	Standby Power Draw (W)
Passaic Valley Regional HS	Projector	Bert 110X	1	8
Passaic Valley Regional HS	Printer	Bert 110X	17	15
Passaic Valley Regional HS	Copier	Bert 110X	6	40
Passaic Valley Regional HS	Snack Vending	Bert 110X	1	40
Passaic Valley Regional HS	Soda Vending	Bert 110X	3	320
Passaic Valley Regional HS	H/C Water Disp.	Bert 110X	11	61
Passaic Valley Regional HS	AC - 110V (15A)	Bert 110X	75	8
Passaic Valley Regional HS	AC - 110V (20A)	Bert 240I Inline	3	8
Passaic Valley Regional HS	AC - 220V (< 20A)	Bert 240I Inline	20	8

Energy Savings and Financial Impact

Please see the Energy Savings and Financial Impact Appendix at the end of this section.

ECM 9 - Cathode Ray TV Upgrade

PASSAIC VALLEY REGIONAL HIGH SCHOOL ECM MATRIX		Passaic Valley Regional HS
✔	ECM was evaluated	
	ECM included in the project	
ECM	**ECM DESCRIPTION**	
9	Cathode TV Upgrade	✔

ECM WAS EVALUATED BUT WAS NOT INCLUDED IN THE ESIP PROJECT

Background & Existing Conditions

LED TVs have become increasingly more affordable over the recent years and many offer several energy savings features such as adjustable brightness, and sleep mode. On average the energy consumption of a cathode ray TV is 90 Watts per hour, in comparison an LED TV consumes 30 Watts per hour. Furthermore, in standby mode Cathode Ray TVs consume 2 -3 Watts per hour, while LED TVs use 0.5 - 1 W per hour. Overall, the power consumption of LED TVs is roughly 300% less than that of Cathode ray TVs, providing an excellent opportunity to reduce electricity consumption in each classroom.

Existing Cathode Ray TV

Scope of Work

- Remove existing cathode ray TVs.
- Install new LED TVs.

ECM Calculations

Energy Savings for the installation of new LED TV's were calculated. The calculated Savings are below.

Cathode Ray TV Opportunities Savings				
BUILDING	**SQFT**	**kWh Original**	**kWh LED**	**kWh Saved**
Passaic Valley Regional HS	248,607	3,600	800	2,800

Energy Savings and Financial Impact

Please see the Energy Savings and Financial Impact Appendix at the end of this section.

ECM 10 - Destratification Fans

PASSAIC VALLEY REGIONAL HIGH SCHOOL ECM MATRIX		Passaic Valley Regional HS
✔ ECM was evaluated		
ECM included in the project		
ECM	**ECM DESCRIPTION**	
10	Destratification Fans	✔

ECM WAS EVALUATED BUT WAS NOT INCLUDED IN THE ESIP PROJECT

Background & Existing Conditions

Large indoor spaces with high ceilings such as a gymnasium are prone to a condition called stratification. Stratification is a common property of air to separate due to temperature difference. Typically, a layer of warm air will sit on top of a layer of cold air. The lower cold air causes discomfort for occupants of the space as well as increased energy usage of air handling systems to overcome this condition. Destratification fans provide the turbulence in the space necessary for warm and cold air to mix. The result is a blended comfortable air temperature with less usage of the rooms HVAC systems.

Destratification fans

Existing gymnasiums at Passaic Valley Regional High School

Scope of Work

- Install destratification fans in gymnasiums or multipurpose rooms.
- Typically, 4 to 6 fans are required per space.

ECM Calculations

Energy Savings for the installation of the destratification fans were calculated. De-strat fans are estimated to save 17.5% to 23.2% of gym HVAC energy. De-strat fans are conservatively estimated to run 8,760 hours per year. The calculated Savings are below.

CALCULATED SAVINGS

Destratification Fan Savings

BUILDING	Area	Space SQFT	HVAC % of Building Gas Use	Large Space Heating / Cooling Multiplier	Estimated Space Heating (Therm)	Estimated Space Fan Use (kWh)	Ceiling Height (ft)	Floor to Ceiling deltaT (F)
Passaic Valley Regional HS	Wrestling Gym	3,995	95%	2	3,053	6,532	22	10.8
Passaic Valley Regional HS	Griswold Gym	20,124	95%	2	15,378	40,935	30	10.8
Passaic Valley Regional HS								

CALCULATED SAVINGS

Destratification Fan Savings

BUILDING	Area	Space SQFT	HVAC Energy Savings (%)	Total DeStrat Fans (#)	DeStrat Fan Power (W)	DeStrat Fan Run Hours (hrs)	DeStrat Fan Energy (kWh)	Energy Savings (kWh)	Energy Savings (Therm)
Passaic Valley Regional HS	Wrestling Gym	3,995	17.5%	4	120	8,760	4,205	(3,062)	534
Passaic Valley Regional HS	Griswold Gym	20,124	23.2%	10	300	8,760	26,280	(16,783)	3,568
Passaic Valley Regional HS									

Energy Savings and Financial Impact

Please see the Energy Savings and Financial Impact Appendix at the end of this section.

ECM 11 - Combined Heat and Power

PASSAIC VALLEY REGIONAL HIGH SCHOOL ECM MATRIX		Passaic Valley Regional HS
✔	ECM was evaluated	
	ECM included in the project	
ECM	**ECM DESCRIPTION**	
11	Combined Heat & Power Unit	✔

Background & Existing Conditions

CHP offers energy and environmental benefits over electric-only and thermal-only systems in both central and distributed power generation applications. CHP systems have the potential for a wide range of applications and the higher efficiencies result in lower emissions than separate heat and power generation.

The simultaneous production of useful thermal and electrical energy in CHP systems lead to increased fuel efficiency. CHP units can be strategically located at the point of energy use. Such onsite generation avoids the transmission and distribution losses associated with electricity purchased via the grid from central stations. CHP is versatile and can be coupled with existing and planned technologies for many different applications in the industrial, commercial, and residential sectors.

The CHP will act as supplemental heating for the hot water boiler plant and domestic hot water loop. The CHPs will shut off when there isn't adequate heating load for combined heating and power. If necessary, heat can be rejected through a radiator when the full heating load is not required.

Scope of Work

- Furnish and Install a new 35 kW CHP at Passaic Valley Regional High School
  - Radiator
  - Heat Exchanger
  - System Pumps
  - Electric Submeter

- Ethylene Glycol System (CHP Loop ONLY)

- Both CHP units will be connected to specific circuits within the building to provide multiple points of resiliency within the facility.
- Connect Gas Service to the new CHP Unit
- Install Power Wiring from the new CHP to the location show on right.
- Furnish and install new concrete housekeeping pads
- Install new piping and connect to the heating hot water system
- Install insulation on new piping
- Install necessary sensor, wells, and flow meters as required for complete system. Sensors, wells, and flow meters will be provided by the EMS Contractor.
- Install new CHP System Pumps
- Installation check, start-up, performance test, & functional testing on the new 10 kW CHP System
- Tie into emergency generator to shut down the CHP in the case that the emergency generator runs.

ECM Calculations

Energy Savings from the installation of a Combined Heat and Power unit were modeled using eQuest. The simulation results are shown below.

CHP Input Data		
Number of units	1	
Thermal output	204,040	BTU/hr
Gas input (HHV)	407,144	Btu/hr
Overall efficiency	79.4%	

Runtime Analysis	
Run hours	1,200
% Boiler load displaced by CHP	26%

		Fuel Usage Without CHP				
Month	Days	Total Gas - Post ECMs (Baseline reduced by 30%)	Proposed Boiler Efficiency	Non-Displaceable Gas Therms (30%)	Displaceable Gas Therms	Displaceable Heat Therms
May	31	549	87%	165	384	334
Jun	30	117	87%	35	82	71
Jul	31	93	87%	28	65	57
Aug	31	458	87%	137	321	279
Sep	30	1,891	87%	567	1,323	1,151
Oct	31	9,187	87%	2,756	6,431	5,595
Nov	30	12,320	87%	3,696	8,624	7,503
Dec	31	15,357	87%	4,607	10,750	9,353
Jan	31	15,229	87%	4,569	10,660	9,274
Feb	28	11,153	87%	3,346	7,807	6,792
Mar	31	3,024	87%	907	2,117	1,842
Apr	30	613	87%	184	429	374
Total:	**365**	**69,991**		**20,997**	**48,994**	**42,625**

		35 kW Cogen Plant Thermal Operation						Fuel Usage With CHP		Electric Savings With CHP			
Month	Days	Utilized Cogen Heat Therms	Dumped Cogen Heat Therms	Max Cogen Heat Therms	Avoided Boiler Gas Therms	Full Load Run Hours	System Operating Efficiency	Cogen Gas Therms	Total Gas	Run Hours	Equivalent Full Load Run Hours	kW Demand Savings	Cogen Electric Generation kWh
May	31	334	1,169	1,503	384	0	44%	2,100	2,265	606	502	35	17,584
Jun	30	71	1,383	1,454	82	0	33%	1,762	1,797	517	420	35	14,717
Jul	31	57	1,446	1,503	65	0	32%	1,416	1,444	430	335	35	11,724
Aug	31	279	1,224	1,503	321	0	62%	822	959	265	192	35	6,712
Sep	30	1,151	303	1,454	1,323	0	394%	313	880	136	68	35	2,380
Oct	31	1,503	0	1,503	1,727	0	1336%	115	2,871	49	25	35	858
Nov	30	1,454	0	1,454	1,672	0	2838%	52	3,748	22	11	35	385
Dec	31	1,503	0	1,503	1,727	0	20416%	7	4,615	3	2	35	53
Jan	31	1,503	0	1,503	1,727	0	1018%	151	4,720	65	33	35	1,138
Feb	28	1,357	0	1,357	1,560	0	318%	466	3,812	183	105	35	3,659
Mar	31	1,503	0	1,503	1,727	0	164%	1,103	2,010	332	260	35	9,114
Apr	30	374	1,081	1,454	429	0	49%	1,787	1,971	534	425	35	14,858
Total:	**365**	**11,089**	**6,606**	**17,695**	**12,747**	**0**	**138%**	**10,093**	**31,090**	**3,142**	**2,377**	**35**	**83,181**

ECM 12 - Window Replacement

PASSAIC VALLEY REGIONAL HIGH SCHOOL ECM MATRIX		Passaic Valley Regional HS
✔	ECM was evaluated	
	ECM included in the project	
ECM	ECM DESCRIPTION	
12	Window Replacement	✔

ECM WAS EVALUATED BUT WAS NOT INCLUDED IN THE ESIP PROJECT

Background & Existing Conditions

A study performed by the Building Science Corporation estimates energy savings up to 10% by improving windows. The seals around windows fail over time allowing infiltration of unconditioned outside air or unwanted release of indoor air which increases the heating and cooling load. This measure calls for the replacement of all exterior weathering stripping and air seals.

Sample high efficiency windows

Windows can be a significant source of air leakage and heat loss as they account for 18% of wall area in most buildings. The linear footage of gap and wind speed is used to estimate the infiltration rate, which is then multiplied by the BIN weather data and the equipment efficiencies to determine the annual energy savings.

Existing windows at Passaic Valley Regional High School

Scope of Work

All single pane windows will be replaced with double pane windows that have better seals and insulation values. This will reduce solar heat gain, conductive losses and outside air leakage. A more specific scope of work includes:

- Coordinate installation time and duration to ensure operations are unaffected
- Remove existing sashes
- Remove existing windows
- Inspect existing window frame and repair or replace any deteriorated parts
- Apply flashing tape to sill
- Install new window
- Install interior and exterior sealant
- Install exterior frame expander

ECM Calculations

Energy Savings for the window replacement were calculated. The calculated savings are below.

CALCULATED SAVINGS						
Window Replacement Savings						
BUILDING	**SQFT**	**WINDOW DESCRIPTION**	**Window SQFT**	**R VALUE (BEFORE)**	**U VALUE (BEFORE)**	**R VALUE (AFTER)**
Passaic Valley Regional HS	41,760	Exterior Single Pane	4,952	1.0	1.042	1.780

CALCULATED SAVINGS								
Window Replacement Savings								
BUILDING	ANNUAL HEATING DEGREE DAYS	AVERAGE ANNUAL HEATING DELTA T	Q BEFORE (BTUH)	Q AFTER (BTUH)	BTUH SAVINGS	ANNUAL HEATING SAVINGS (BTU)	BOILER HEATING EFFICIENCY	TOTAL HEATING SAVINGS (THERM)
Passaic Valley Regional HS	3,618	14.9	76,923	41,486	35,436	310,422,240	87%	3,568

CALCULATED SAVINGS									
Window Replacement Savings									
BUILDING	ANNUAL COOLING DEGREE DAYS	AVERAGE ANNUAL COOLING DELTA T	Q BEFORE (BTUH)	Q AFTER (BTUH)	BTUH COOLING SAVINGS	ANNUAL COOLING SAVINGS (BTU)	COOLING EFFICIENCY (EER - BTU/Wh)	COOLING EFFICIENCY (kW/TON)	COOLING SAVINGS (kWh)
Passaic Valley Regional HS	859	9.4	48,254	26,024	22,229	194,728,219	12.0	1.00	16,227

CALCULATED SAVINGS			
Window Replacement Savings			
BUILDING	HOURS	TOTAL ELECTRIC SAVINGS (kWh)	TOTAL GAS SAVINGS (THERMS)
Passaic Valley Regional HS	8,760	16,227	3,568

Energy Savings and Financial Impact

Please see the Energy Savings and Financial Impact Appendix at the end of this section.

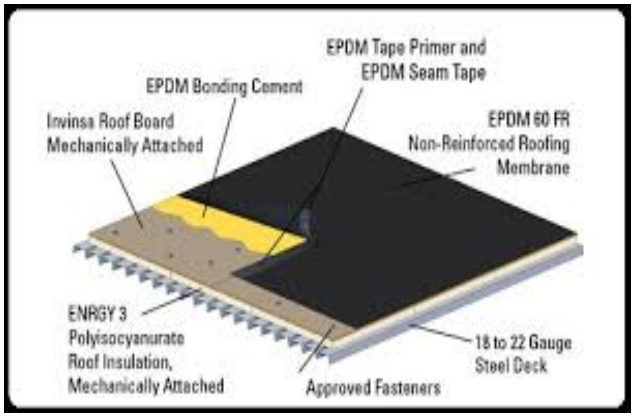
ECM 13 - Roof Replacement & Repairs

PASSAIC VALLEY REGIONAL HIGH SCHOOL ECM MATRIX		Passaic Valley Regional HS
✔	ECM was evaluated	
	ECM included in the project	
ECM	**ECM DESCRIPTION**	
13	Roof Renovations	✔

ECM WAS EVALUATED BUT WAS NOT INCLUDED IN THE ESIP PROJECT

Background & Existing Conditions

EPDM is a synthetic rubber that covers the entirety of your roof, forming a durable membrane that keeps the elements on the outside where they belong. However, while there is no questioning its strength, you don't have to worry that an EPDM roofing system is going to add a dangerous amount of weight onto your structure. EPDM generally weighs about 1/3 a pound per square foot. Just about any building out there is a candidate for EPDM, thanks to how lightweight it is.



Scope of Work

Roof repairs are being evaluated in the ESIP project only where the existing roof systems do not have 15 years of warranty remaining.

Passaic Valley Regional High School

Roof Area – 131,000 Sq Ft

ECM Calculations

Energy Savings for roof replacement and repairs were modeled using eQuest. The simulation results are shown below.

ENERGY MODELING OUTPUTS								
Roof Restoration Savings								
BUILDING	SQFT	MODEL % ELECTRIC SAVINGS	% ROOF AREA REPLACED	kWh SAVINGS	MODEL % DEMAND SAVINGS	kW SAVINGS	MODEL % THERM SAVINGS	THERM SAVINGS
Passaic Valley Regional HS	248,607	0.0%	100%	545	0.5%	5	2.6%	2,565

Energy Savings and Financial Impact

Please see the Energy Savings and Financial Impact Appendix at the end of this section.

ECM 14 - Building Envelope Improvement

PASSAIC VALLEY REGIONAL HIGH SCHOOL ECM MATRIX		Passaic Valley Regional HS
✔	ECM was evaluated	
	ECM included in the project	
ECM	**ECM DESCRIPTION**	
14	Building Envelope Improvements	✔

ECM WAS EVALUATED BUT WAS NOT INCLUDED IN THE ESIP PROJECT

Background & Existing Conditions

The seals around exterior doors and windows fail over time allowing infiltration of unconditioned outside air or unwanted release of indoor air which increases the heating and cooling load. This measure calls for the replacement of all exterior weathering stripping and air seals.

The linear footage of gap and wind speed is used to estimate the infiltration rate, which is then multiplied by the BIN weather data and the equipment efficiencies to determine the annual energy savings.

Existing air sealing opportunities at Passaic Valley Regional HS

Scope of Work

Building envelope improvements will be investigated during the investment grade audit. A typical scope of work includes:

- Roof-wall intersection air sealing
- Overhang air sealing

- Wall air sealing
- Wall barrier construction
- Attic bypass air sealing
- Door weather stripping

ECM Calculations

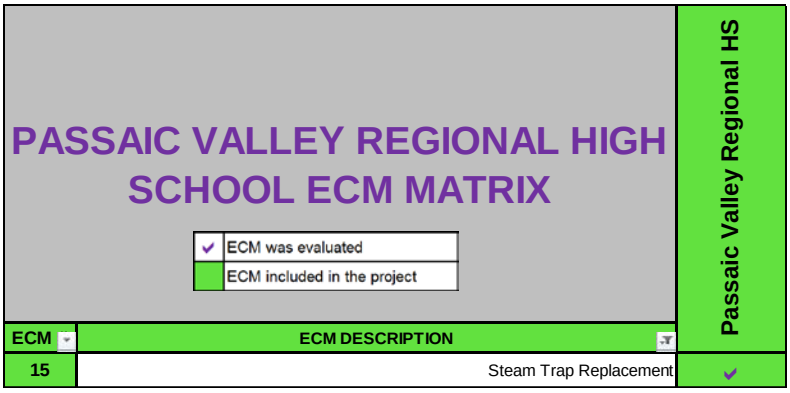
Energy Savings for roof replacement and repairs were modeled using eQuest. The simulation results are shown below.

ENERGY MODELING OUTPUTS								
Buildin Envelope Savings								
BUILDING	SQFT	INFILTRATION REDUCTION (CFM)	MODEL % ELECTRIC SAVINGS	kWh SAVINGS	MODEL % DEMAND SAVINGS	kW SAVINGS	MODEL % THERM SAVINGS	THERMS SAVINGS
Passaic Valley Regional HS	248,607	3,641	0%	(2,555)	0%	4	3%	3,436

Energy Savings and Financial Impact

Please see the Energy Savings and Financial Impact Appendix at the end of this section.

ECM 15 - Steam Trap Replacement



Background & Existing Conditions

A steam trap is a device used to discharge condensate and non-condensable gases with a negligible consumption or loss of live steam. Most steam traps are nothing more than automatic valves. They open, close, or modulate automatically. The three important functions of steam traps are:

1. Discharge condensate as soon as it is formed
2. Have negligible steam consumption
3. Have the capability of discharging air and other non-condensable gases

The best and simplest form of steam trap is a disc or short solid pipe nipple with a small hole drilled through it installed at the lowest point of the equipment. Since steam condensate will collect at the lowest point and live steam is as about 1,200 greater in volume than this hot liquid, condensate is effectively removed, and steam is blocked. Mechanical steam traps basically open when condensate needs to be removed, and close when there is only steam present. Steam traps work best when sized specifically for the application they are used on. Generally, it is better to over size as they will still discharge condensate when present and close or obstruct for live steam. However, an oversized steam trap will wear quickly, waste energy (use steam), and if drastically oversized can cause process issues.

The chart below summarizes the energy requirements of a variety of ½" traps at 5 bar g.

Energy requirement of traps expressed in kg/h of steam

	No-load			Reasonable load		
	Through trap	From trap	Total	Through trap	From trap	Total
Thermostatic	0.50	0.50	1.00	Nil	0.50	0.50
Float	Nil	1.40	1.40	Nil	1.40	1.40
Inverted bucket	0.50	1.20	1.70	Nil	1.20	1.20
Thermodynamic	0.50	0.25	0.75	Nil	0.25	0.25

The International Standard ISO 7841 (1988) and European Standard CEN 27841 (1991) - Determination of steam loss of automatic steam traps - describe a reliable and accurate test methodology for losses from any type of steam trap. **Any manufacturers' test figures that are not obtained within the parameters of these standards should be treated with caution.**

The purpose of the above chart is not to establish the fact that one type of trap is marginally more efficient than another. It is simply to make the point that steam traps use a minimal amount of energy. Losses only become significant when traps are defective. The important thing therefore is to combine selection, checking and maintenance to achieve reliability. Properly done, costs and steam wastage will be minimized.

Typical steam traps

Scope of Work

Replace failed steam traps and institute a protocol for regular steam trap maintenance and replacement as needed. Due to the synergies between this ECM and Vacuum Return System Replacement, a simultaneous implementation is recommended to realize the full benefit of both measures.

ECM Calculations

CALCULATED SAVINGS								
Steam Trap Savings								
BUILDING	**SQFT Heated by Boilers**	**Trap Pipe Size (Inches)**	**Trap Orifice Diameter (Inches)**	**% of orifice passing steam**	**Leakage Diameter**	**Leakage Area**	**Number of failed traps based on 30% failure rate**	**Total Number of Known Traps**
Passaic Valley Regional HS	248,607	0.75	0.2180	0.3000	0.0936	0.2055	14	48

CALCULATED SAVINGS							
Steam Trap Savings							
BUILDING	**SQFT Heated by Boilers**	**Steam Pressure (lbs)**	**Steam Loss(lbs/hr)**	**Operating Hours**	**Total Steam Loss (lbs)**	**Total BTU**	**Total Therms**
Passaic Valley Regional HS	248,607	15	4	2,000	126,281	145,223,134	1,452

Energy Savings and Financial Impact

Please see the Energy Savings and Financial Impact Appendix at the end of this section.

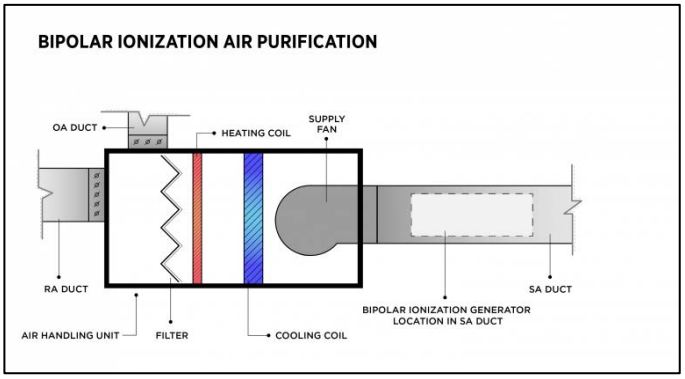
ECM 16 - GPS Bi-Polar Ionization Air Cleaners

PASSAIC VALLEY REGIONAL HIGH SCHOOL ECM MATRIX		Passaic Valley Regional HS
✔	ECM was evaluated	
	ECM included in the project	
ECM	**ECM DESCRIPTION**	
16	GPS Bi-Polar Ionization Air Cleaners	✔

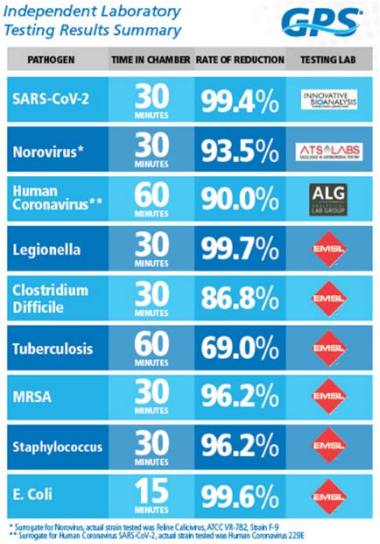
ECM WAS EVALUATED BUT WAS NOT INCLUDED IN THE ESIP PROJECT

Background & Existing Conditions

Pathogens such as mold, viruses and bacteria can all be suspended in the air we breathe, virtually invisible to the eye. Along with pathogens, pollutants, dust, dander, pollen, and smoke can also be intertwined in incoming ventilation air for buildings. Bipolar ionization has become a beneficial way to increase indoor air quality and provide safe and healthy ventilation air to building occupants.



Bi-polar ionization produces a natural bio-climate which is rich in positive and negative oxygen ions. The negative ions contain an extra electron while the positive ions are missing an electron resulting in an unstable condition. To restabilize, these bipolar ions seek out atoms and molecules in the air to trade electrons with, effectively neutralizing particulate matter, bacteria and virus cells, odorous gases and aerosols, and VOCs. Bi-polar ionizers can be installed in the supply air of ductwork or in the HVAC unit itself. Ionizers can also be installed in both new equipment and be retrofitted into older systems. Recently, Bi-polar ionization has been highlighted as a key method in combating the Covid-19 outbreak within indoor air of commercial, educational and government buildings.



Existing air handling unit at Passaic Valley Regional HS

ECM Calculations

There are no Energy Savings associated with this Energy Conservation Measure.

Energy Savings and Financial Impact

Please see the Energy Savings and Financial Impact Appendix at the end of this section.

ENERGY SAVINGS PLAN

SECTION 4 – FINANCIAL ANALYSIS

Form V – ESCO Construction and Service Fees

FORM V		
ESCO's ENERGY SAVINGS PLAN (ESP): ESCOs PROPOSED FINAL PROJECT COST FORM PASSAIC VALLEY REGIONAL HIGH SCHOOL ENERGY SAVING IMPROVEMENT PROGRAM		
ESCO Name: DCO Energy PROPOSED CONSTRUCTION FEES:		
Fee Category	Fees [1] Dollar ($) Value	Percentage of Hard Costs
Estimated Value of Hard Costs [2]	$ 1,429,436	N/A
ECM Contingency	$ 47,171	
Total Value of Hard Costs	$ 1,476,607	
Project Service Fees		
DCO Energy	$ 265,789	18.00%
Alaimo Group	$ 251,023	17.00%
Project Service Fees Sub Total	$ 516,813	35.00%
TOTAL FINANCED PROJECT COSTS:	$ 1,993,420	

Form VI – Project Cash Flow Analysis

FORM VI

ESCO's ENERGY SAVINGS PLAN (ESP):
ESCO's ANNUAL CASH FLOW ANALYSIS FORM
PASSAIC VALLEY REGIONAL HS - ENERGY SAVING IMPROVEMENT PROGRAM

ESCO Name: DCO Energy

Note: Respondents must use the following assumptions in all financial calculations:
(a) The cost of all types of energy should be assumed to inflate at **2.4% gas, 2.2%** electric per year and
1. Term of Agreement: 20 years
2. Construction Period [2] (months): 12 Months
3. Cash Flow Analysis Format:

Additional Fees	
Cost of Issuance	$35,000
Total	$35,000

Project Cost[1]: **$1,993,420**
Miscellaneous:
Additional Fees: **$35,000**
Financed Amount: **$2,028,420**

Interest Rate: **2.50%**

Year	Annual Energy Savings	Annual Operational Savings	Energy Rebates / Incentives	Total Annual Savings	Annual Project Costs	Net Cash-Flow to Client	Cumulative Cash Flow
Installation							
Year 1	$ 115,584	$ 16,384	$ 99,403	$ 231,370	$ (228,920)	$ 2,451	$ 2,451
Year 2	$ 96,975	$ 16,384	$ 99,403	$ 212,761	$ (210,311)	$ 2,451	$ 4,901
Year 3	$ 99,172	$ 16,384	$ 2,955	$ 118,510	$ (116,060)	$ 2,451	$ 7,352
Year 4	$ 101,418	$ 16,384	$ 2,955	$ 120,757	$ (118,306)	$ 2,451	$ 9,802
Year 5	$ 103,716	$ 16,384		$ 120,100	$ (117,649)	$ 2,451	$ 12,253
Year 6	$ 106,066			$ 106,066	$ (103,615)	$ 2,451	$ 14,703
Year 7	$ 108,469			$ 108,469	$ (106,018)	$ 2,451	$ 17,154
Year 8	$ 110,927			$ 110,927	$ (108,476)	$ 2,451	$ 19,604
Year 9	$ 113,440			$ 113,440	$ (110,989)	$ 2,451	$ 22,055
Year 10	$ 116,010			$ 116,010	$ (113,560)	$ 2,451	$ 24,505
Year 11	$ 118,639			$ 118,639	$ (116,189)	$ 2,451	$ 26,956
Year 12	$ 121,328			$ 121,328	$ (118,877)	$ 2,451	$ 29,406
Year 13	$ 124,077			$ 124,077	$ (121,627)	$ 2,451	$ 31,857
Year 14	$ 126,889			$ 126,889	$ (124,439)	$ 2,451	$ 34,307
Year 15	$ 129,765			$ 129,765	$ (127,315)	$ 2,451	$ 36,758
Year 16	$ 132,706			$ 132,706	$ (130,256)	$ 2,451	$ 39,208
Year 17	$ 135,714			$ 135,714	$ (133,263)	$ 2,451	$ 41,659
Year 18	$ 138,790			$ 138,790	$ (136,340)	$ 2,451	$ 44,109
Year 19	$ 141,936			$ 141,936	$ (139,486)	$ 2,451	$ 46,560
Year 20	$ 145,153			$ 145,153	$ (142,703)	$ 2,451	$ 49,010
Totals	$ 2,386,775	$ 81,919	$ 204,715	$ 2,673,409	$ (2,624,399)	$ 49,010	

NOTES:
(1) Includes: Hard costs and project service fees defined in ESCO's PROPOSED "FORM V"
(2) No payments are made by Hillside Township Board of Education during the construction period.
(3) This figure should equal the value indicated on the ESCO's PROPOSED "FORM V". DO NOT include in the Financed Project Cost.

Utility Inflation Details

Per Form VI, the annual inflation rate for electric is 2.2%, natural gas and fuel oil is 2.4% and 2% for solar per PPA bid results.

Utility Inflation Worksheet			
Year	TOTAL ANNUAL ELECTRIC COST SAVINGS (EXCLUDING SOLAR PPA SAVINGS)	ANNUAL NATURAL GAS COST SAVINGS	Total
1	$63,889	$30,937	$94,826.82
2	$65,294.94	$31,679.94	$96,974.89
3	$66,731.43	$32,440.26	$99,171.69
4	$68,199.52	$33,218.83	$101,418.35
5	$69,699.91	$34,016.08	$103,715.99
6	$71,233.31	$34,832.47	$106,065.78
7	$72,800.44	$35,668.45	$108,468.89
8	$74,402.05	$36,524.49	$110,926.54
9	$76,038.90	$37,401.08	$113,439.97
10	$77,711.75	$38,298.70	$116,010.45
11	$79,421.41	$39,217.87	$118,639.28
12	$81,168.68	$40,159.10	$121,327.78
13	$82,954.39	$41,122.92	$124,077.31
14	$84,779.39	$42,109.87	$126,889.26
15	$86,644.53	$43,120.51	$129,765.04
16	$88,550.71	$44,155.40	$132,706.11
17	$90,498.83	$45,215.13	$135,713.96
18	$92,489.80	$46,300.29	$138,790.10
19	$94,524.58	$47,411.50	$141,936.08
20	$96,604.12	$48,549.37	$145,153.50

ENERGY SAVINGS PLAN

SECTION 5 – RISK, DESIGN, & COMPLIANCE

Assessment of Risks, Design & Compliance Issues

Moving from a conceptual design to engineered documents DCO has identified areas of the project that could change during the detailed design. The table below represents potential conceptual areas of concern that will need to be investigated further with a corresponding party responsible for the compliance of each item.

Issue	Category	Responsible Party
Alteration of expected Maintenance and Operational Savings	Risk	Passaic Valley Regional High School
Disposition of Abandoned Equipment (Steam Piping, Condensate Piping, Oil Tanks, etc.)	Risk	Passaic Valley Regional High School
New Natural Gas Distribution	Risk	Passaic Valley Regional High School
Integrity of re-used Infrastructure	Risk	Passaic Valley Regional High School
Life Safety System Coordination	Risk	Passaic Valley Regional High School
Coordination with Passaic Valley Regional High School Information Technology Department	Risk	Passaic Valley Regional High School
Ventilation Compliance with Code	Compliance	Consulting Engineer
Temperature, Humidity and Air Change Compliance with Code	Compliance	Consulting Engineer
Boiler Capacity and Turndown	Design	Consulting Engineer
Natural Gas Regulator Compliance with Code	Compliance	Consulting Engineer
Undocumented Underground Utilities	Risk	Consulting Engineer

Code Compliance of Existing Electrical Infrastructure	Compliance	Consulting Engineer
Lighting Levels	Compliance	Consulting Engineer
Design Light Consortium rating for bulbs	Compliance	Consulting Engineer
Underwriters Laboratory Testing for retrofitted LED Lighting Systems	Compliance	Consulting Engineer
Lighting Retrofits within hard ceilings for fixtures and occupancy sensors	Risk	Consulting Engineer
Street/Parking Lot Pole Structural Integrity	Risk	Consulting Engineer
Unrealized Energy Savings 1. Energy Modeling 2. Performance Monitoring 3. Capacity of Equipment 4. Efficiency of Equipment 5. Run Hours of Equipment	Risk	DCO/ Consulting Engineer 1. DCO 2. DCO 3. Consulting Engineer / Basis of Design Vendor 4. Consulting Engineer / Basis of Design Vendor 5. Passaic Valley Regional High School
Existing Plumbing Infrastructure with New Low Flow Devices	Design	Consulting Engineer
Adaptation to New RTUs (Curb, Electric, Ductwork, Condensate)	Design	Consulting Engineer / Basis of Design Manufacture
Structural Loads for Rooftop Equipment Replacement	Design	Consulting Engineer
Transformer Loading	Risk	Consulting Engineer
Site Work for Equipment	Design	Consulting Engineer
Condition of Roof Under Units	Risk	Consulting Engineer

Adequate Crane Lifts & Clearances	Design	Consulting Engineer / Rigger
Physical Space Constraints and Clearance for Equipment Replacement	Design	Consulting Engineer
Refrigerant Reclaim / Refrigerant Disposal	Compliance	Contractor
Existing Tie in Locations	Design	Consulting Engineer
Schedule Oversight	Risk	DCO Energy
Impact of Boiler Flue	Design	Consulting Engineer
Impact of Space Usage During Construction	Risk	Consulting Engineer & Passaic Valley Regional High School
Scope changes relating to requests by Authorities Having Jurisdiction.	Risk	Passaic Valley Regional High School (via contingency)
Department of Environmental Protection Permitting	Risk	Consulting Engineer
Modifications of Energy Saving Control Sequences and Setpoints impacting Energy Savings and Incentives	Risk	Passaic Valley Regional High School
Post Construction Calibration of Sensors, Meters, & Safety Devices	Risk	Passaic Valley Regional High School
Adequate time and access for bidding contractor site surveys	Risk	Passaic Valley Regional High School
Utility Interconnection approval for the CHP Unit	Risk	Passaic Valley Regional High School

Maintenance Plan

Owner Tasks and Responsibilities:

As a general statement, Passaic Valley Regional High School or its 3rd party service providers shall be responsible for providing ongoing maintenance through the duration of the M&V period. DCO will review operational procedures and schedules associated with such things as the building automation/control upgrades as well as the manufacturers' published requirements for all installed equipment be it: quarterly, semi-annually or annually. In most cases, Passaic Valley Regional High School is already aware of or self-implementing similar maintenance practices on campus or has contracted a 3rd party for such services. Failure to properly maintain the equipment may cause energy savings goals to fall short.

Specific Areas of Consideration:

In order to sustain energy savings Passaic Valley Regional High School's Staff will be required to implement new maintenance tasks and even modify existing policies and practices. Outlined are two examples of specific instances.

Example 1. Advanced Building Operations Programming:

Passaic Valley Regional High School will be given specific training on the changes and advancements in the environmental operations and energy savings strategies. Passaic Valley Regional High School will be responsible for following the agreed upon guidelines associated with programmed schedules and any use of override functions.

Example 2. Verification of Proper Operations: Mechanical Equipment

Passaic Valley Regional High School will be required to assure that proper mechanical maintenance continues to be implemented on its mechanical equipment. Example: outside air dampers will require proper operation with the appropriate seals in order to maintain ECM(s) such as demand ventilation. DCO will periodically spot check system operations to verify the Owner or its 3rd party representative is implementing proper maintenance. Any deficiencies that may be identified will be brought to Passaic Valley Regional High School's attention for correction.

ENERGY SAVINGS PLAN

SECTION 6 – OPERATION & MAINTENANCE

It is critical to the success of achieving continued energy savings that Passaic Valley Regional High School develop and implement an Operation and Maintenance Plan. In this section are some recommendations for maintenance tasks for various pieces of equipment and systems to assist Passaic Valley Regional High School and/or 3rd party maintenance contractors.

Air Handling Units

Comprehensive Annual Inspection

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Inspect the unit for cleanliness.
   b) Inspect the fan wheel and shaft for wear and clearance.
   c) Check the sheaves and pulleys for wear and alignment.
   d) Check the belts for tension, wear, cracks, and glazing.
   e) Verify tight bolts, set screws, and locking collars.
   f) Check dampers for wear, security and linkage adjustment.
   g) Verify clean condensate pan.
   h) Verify proper operation of the condensate drain.
   i) Verify clean air filters.
   j) Verify clean coils.
   k) Verify proper operation of the spray pump, if applicable.
   l) Verify smooth fan operation.
   m) Log operating conditions after system has stabilized.
   n) Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.
4. Lubrication
   a) Lubricate the fan shaft bearings, if applicable.
   b) Lubricate the motor bearings, if applicable.
5. Controls and Safeties
   a) Test the operation of the low temperature safety device, if applicable.
   b) Test the operation of the high static pressure safety device, if applicable.
   c) Test the operation of the low static pressure safety device, if applicable.

d) Check the thermal cutout on electric heaters, if applicable.
e) Check the step controller, if applicable.
f) Check and record supply air and control air pressure, if applicable.
g) Verify the operation of the control system and dampers while the fan is operating.

6. Motor and Starter
   a) Clean the starter and cabinet.
   b) Inspect the wiring and connections for tightness and signs of overheating and discoloration. This includes wiring to the electric heat, if applicable.
   c) Check the condition of the contacts for wear and pitting.
   d) Check the contactors for free and smooth operation.
   e) Meg the motor and record readings.

Heating Inspection

1. Gas Heat Option
   a) Visually inspect the heat exchanger.
   b) Inspect the combustion air blower fan, and clean, if required.
   c) Lubricate the combustion air blower fan motor, if applicable.
   d) Verify the operation of the combustion air flow-proving device.
   e) Test the operation of the high gas pressure safety device, if applicable. Calibrate, if necessary.
   f) Test the operation of the low gas pressure safety device, if applicable. Calibrate, if necessary.
   g) Verify the operation of the flame detection device.
   h) Test the operation of the high temperature limit switch.
   i) Verify the integrity of the flue system.
   j) Verify the operation of the operating controls.
   k) Verify the burner sequence of operation.
   l) Verify proper gas pressure to the unit and/or at the manifold, if applicable.
   m) Perform combustion test. Make adjustments as necessary.
2. Electric Heat Option
   a) Inspect wiring and connections for tightness and signs of overheating and discoloration.
   b) Check and calibrate operating and safety controls, if applicable.
   c) Verify the operation of the heating elements.
   d) Check voltage and amperage and compare readings with the watt rating on the heater.
3. Hot Water / Steam Heat Option
   a) Inspect control valves and traps.
   b) Check and calibrate all operating and safety controls.

c) Verify the operation of the heating coils.
d) Verify the operation of the unit low temperature safety device.

Scheduled Running Inspection

1. Check the general condition of the fan.
2. Verify smooth fan operation.
3. Check and record supply and control air pressure, if applicable.
4. Verify the operation of the control system.
5. Log the operating conditions after the system has stabilized.
6. Review operating procedures with operating personnel.
7. Provide a written report of completed work, operating log, and indicate uncorrected deficiencies detected.

Oil Sample/Spectrographic Analysis

1. Pull oil sample for spectrographic analysis

Refrigerant Sample/Analysis

1. Pull refrigerant sample for spectrographic analysis for contaminants (oil, water, and acid), using approved containers

Boilers

Comprehensive Annual Inspection

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Secure and drain the boiler.
   b) Open the fire and water side for cleaning and inspection.
   c) Check heating surfaces and water side for corrosion, pitting, scale, blisters, bulges, and soot.

d) Inspect refractory.
e) Clean fire inspection glass.
f) Check blow-down valve packing, and lubricate.
g) Check and test boiler blow-down valve.
h) Perform hydrostatic test, if required.
i) Verify proper operation of the level float.
j) Gas Train Burner Assembly
    1. Check the gas train isolation valves for leaks.
    2. Check the gas supply piping for leaks.
    3. Check the gas pilot solenoid valve for wear and leaks.
    4. Check the main gas and the pilot gas regulators for wear and leaks.
    5. Test the low gas pressure switch. Calibrate and record setting.
    6. Test the high gas pressure switch. Calibrate and record setting.
    7. Verify the operation of the burner fan air flow switch.
    8. Inspect and clean the burner assembly.
    9. Inspect and clean the pilot igniter assembly.
    10. Inspect and clean the burner fan.
    11. Run the fan and check for vibration.
    12. Inspect the flue and flue damper.
    13. Burner Control Panel:
        a) Inspect the panel for cleanliness.
        b) Inspect wiring and connections for tightness and signs of overheating and discoloration.
k) Clean burner fan wheel and air dampers. Check fan for vibration.
l) Verify tightness on linkage set screws.
m) Check gas valves for leakage (where test cocks are provided).
n) Verify proper operation of the feed water pump.
o) Verify proper operation of the feed water treating equipment.

4. Controls and Safeties
    a) Disassemble and inspect low water cutoff safety device.
    b) Reassemble boiler low water cutoff safety device with new gaskets.
    c) Clean contacts in program timer, if applicable.
    d) Check the operation of the low water cutoff safety device and feed controls.
    e) Verify the setting and test the operation of the operating and limit controls.
    f) Verify the operation of the water level control.

Startup/Checkout Procedure

1. Verify proper water level in the boiler
2. Test the safety/relief valve after startup (full pressure test).
3. Clean or replace fuel filters.
4. Clean fuel nozzles.
5. Inspect clean, and functionally test the flame scanner and flame safeguard relay.
6. Clean and adjust the ignition electrode.
7. Replace the vacuum tube in the flame safeguard control, if applicable.
8. Perform pilot turn down test.
9. Verify proper steam pressure.
10. Perform combustion test and adjust the burner for maximum efficiency.
11. Test the following items:
    a) Firing rate
    b) Fuel/air ratio
    c) CO2
    d) CO
    e) NOX
    f) Perform smoke test.
12. Review operating procedures
13. Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

Mid-Season Running Inspection

1. Check the general condition of the unit.
2. Inspect the burner.
3. Adjust the burner controls to obtain proper combustion.
4. Check the operation of the pressure relief valve.
5. Check the operation of the low water cutoff and feed controls.
6. Check the setting and test the operation of the operating and limit controls.
7. Check the operation of the modulating motor.
8. Lift the safety/relief valves with at least 70% of rated pressure.
9. Blow down and try gauge cocks to confirm glass water level.
10. Check and test boiler blow down valve.
11. Log operating conditions after the system has stabilized.

12. Review operating procedures
13. Provide a written report of completed work, operating log, and indicate uncorrected deficiencies detected.

Seasonal Shut-down Procedure

1. Shut down boiler at boiler controls.
2. Shut off fuel lines at main valves.
3. Review operating procedures
4. Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

Burners

Gas Train

1. Check the gas train isolation valves for leaks.
2. Check the gas supply piping for leaks.
3. Check the gas pilot solenoid valve for wear and leaks.
4. Check the main gas and the pilot gas regulators for wear and leaks.
5. Test the low gas pressure switch. Calibrate and record setting.
6. Test the high gas pressure switch. Calibrate and record setting.
7. Verify the operation of the burner fan air flow switch.
8. Inspect and clean the burner assembly.
9. Inspect and clean the pilot ignitor assembly.
10. Inspect and clean the burner fan.
11. Run the fan and check for vibration.
12. Inspect the flue and flue damper.
13. Burner Control Panel:
    a) Inspect the panel for cleanliness.
    b) Inspect wiring and connections for tightness and signs of overheating.
14. Clean burner fan wheel and air dampers. Check the fan for vibration.
15. Verify tightness of the linkage set screws.

16. Check the gas valves against leakage (where test cocks are provided

Oil Train

1. Check the gas train isolation valves for leaks.
2. Check the gas supply piping for leaks.
3. Check the gas pilot solenoid valve for wear and leaks.
4. Check the main gas and the pilot gas regulators for wear and leaks.
5. Test the low gas pressure switch. Calibrate and record setting.
6. Test the high gas pressure switch. Calibrate and record setting.
7. Verify the operation of the burner fan air flow switch.
8. Inspect and clean the burner assembly.
9. Inspect and clean the pilot ignitor assembly.
10. Inspect and clean the burner fan.
11. Run the fan and check for vibration.
12. Inspect the flue and flue damper.
13. Burner Control Panel:
    a) Inspect the panel for cleanliness.
    b) Inspect wiring and connections for tightness and signs of overheating.
14. Clean burner fan wheel and air dampers. Check the fan for vibration.
15. Verify tightness of the linkage set screws.
16. Check the gas valves against leakage (where test cocks are provided).

Dual Fuel Train

1. Check the gas train isolation valves for leaks.
2. Check the gas supply piping for leaks.
3. Check the gas pilot solenoid valve for wear and leaks.
4. Check the main gas and the pilot gas regulators for wear and leaks.
5. Test the low gas pressure switch. Calibrate and record setting.
6. Test the high gas pressure switch. Calibrate and record setting.
7. Verify the operation of the burner fan air flow switch.
8. Inspect and clean the burner assembly.
9. Inspect and clean the pilot ignitor assembly.
10. Inspect and clean the burner fan.

11. Run the fan and check for vibration.
12. Inspect the flue and flue damper.
13. Burner Control Panel:
    a) Inspect the panel for cleanliness.
    b) Inspect wiring and connections for tightness and signs of overheating.
14. Clean burner fan wheel and air dampers. Check the fan for vibration.
15. Verify tightness of the linkage set screws.
16. Check the gas valves against leakage (where test cocks are provided)

Energy Management System

Maintenance Inspection

1. Review reports for operational problems and trends.
2. Make a back-up copy of the BAS program.
3. Check for loose or damaged parts or wiring.
4. Check for any accumulation of dirt or moisture. Clean if required.
5. Verify proper electrical grounding.
6. Verify control panel power supplies for proper output voltages.
7. Inspect interconnecting cables and electrical connections.
8. Verify that manual override switches are in the desired positions.
9. Check the operation of all binary and analog outputs, if applicable.
10. Calibrate control devices, if applicable.
11. Verify the correct time and date.
12. Check and update the holiday schedules and daylight savings time.
13. Via terminal mode, view the event log and input/output points for any unusual status or override conditions.
14. Clean the external surfaces of the panel enclosure.
15. Review operating program and parameters.
16. Check cable connections for security.
17. Review operating procedures
18. Provide a written report of completed work, and indicate any uncorrected deficiencies detected.

Maintenance Inspection (Control Panels)

1. Control Panel
   a) Verify secure connections on all internal wiring, LAN, and communication links.
   b) Check for loose or damaged parts or wiring.
   c) Check for any accumulation of dirt or moisture. Clean if required.
   d) Remove excessive dust from heat sink surfaces
   e) Verify proper system electrical grounding.
   f) Verify proper output voltages on control panel power supplies.
   g) Check LED Indications to verify proper operation
   h) Verify LAN communications
   i) Verify that cards are seated and secured.
   j) Check wiring trunks and check for possible Error Code Indications
   k) Check voltage level of
   l) Verify the proper operation of critical control processes and points associated with this unit an make adjustments if necessary.
   m) Check Volatile memory available
   n) Cheek Non volatile memory available
   o) Check Processor idle time
   p) Clean external surfaces of the panel enclosure.
   q) Check modem operation, if applicable.
   r) View the event log and input/output points for any unusual status or override conditions.
   s) Verify correct time and date.
   t) Check and update holiday schedules, if applicable, and daylight savings time.
   u) Review operating procedures with operating personnel.
   v) Provide a written report of completed work, and indicate any uncorrected deficiencies detected.

Maintenance Inspection (EMS - Sequence of Operations)

Central Plant

In order to assure effective environmental conditioning while minimizing the cost to operate the equipment, technicians will review operating sequences and practices for the chiller plant. An initial survey of current equipment operating parameters will be conducted within the first 60 days of the contract term during cooling season. This survey will include:

1. Chiller(s) operation
2. Cooling tower(s) operation
3. Pump(s) operation
4. Economizer operation (where applicable)
5. Environmental safety

A detailed report of findings and recommendations for changes, if any, will be made. Agreed upon operational changes which require only adjustment of controls or programming will be made during regularly scheduled maintenance visits as part of this agreement at no additional cost. Any recommended alterations that require addition of devices or equipment will be accompanied by a guaranteed cost proposal reflecting the applicable discounts determined by this agreement.

Building Systems

In order to assure effective environmental conditioning while minimizing the cost to operate the equipment, technicians will review operating sequences and practices for covered airside systems. An initial survey of current systems operating parameters will be conducted within the first 60 days of the contract term, except seasonally operated systems, which will be surveyed during the appropriate operating season. This survey will include:

1. Time schedule(s)
2. Reset schedule(s)
3. Economizer changeover (where applicable)
4. Setpoints
5. Energy Management routines

A detailed report of findings and recommendations for changes, if any, will be made. Agreed upon operational changes which require only adjustment of controls or programming will be made during regularly scheduled maintenance visits as part of this agreement at no additional cost. Any recommended alterations that require addition of devices or equipment will be accompanied by a guaranteed cost proposal reflecting the applicable discounts determined by this agreement.

Fans

Maintenance Procedure

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Check the general condition of the unit.
   b) Verify tightness of the fan, fan guards, louvers, etc.
   c) Verify clean burner assembly.
   d) Check sheaves and pulleys for wear and alignment, if applicable.
   e) Check belts for tension, wear, cracks, and/or glazing.
4. Lubrication
   a) Lubricate the fan motor, if applicable.
   b) Lubricate the fan bearings as necessary.
5. Controls and Safeties
   a) Verify proper operation of the temperature control device.
   b) Verify proper operation of the high temperature control device.
   c) Verify proper operation of the fan switch.
   d) Verify proper operation of the pilot safety device, if applicable.
6. Electrical
   a) Inspect wiring and connections for tightness and signs of overheating and discoloration.
7. Startup and Checkout
   a) Start the unit.
   b) Verify proper combustion air to the burner.
   c) Verify proper gas pressure to the burner.
   d) Check the flame for proper combustion.

Comprehensive Annual Inspection

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Disassemble all screens and panels necessary to gain access to the fan mechanism.
   b) Disassemble the control mechanism (AVPB only).

c) Clean all accessible rotor components to include control pitch mechanism (AVPB only).
d) Inspect blades for wear.
e) Inspect blade arms for wear (AVPB only).
f) Check blade tip clearance.
g) Check for oil leak on the blade bearing housing (AVPB only).
h) Clean motor and fan housing.
i) Reassemble all removed screens and plates.

4. Lubrication
   a) Lubricate the motor bearings.
   b) Lubricate the shaft bearings (AVPA only).
5. Controls and Safeties
   a) Test the operation of the high static safety device. Calibrate and record setting.
   b) Test the operation of the low static safety device. Calibrate and record setting.
   c) Test the operation of the vibration safety device. Calibrate and record setting.
   d) Verify the operation of the phase monitor, if applicable.
   e) Inspect pneumatic and electrical controls for condition and calibration.
   f) Verify proper operation.
6. Motor and Starter
   a) Clean the starter and cabinet.
   b) Clean the disconnect switch and cabinet at the fan, if applicable.
   c) Inspect the wiring and connections for tightness and signs of overheating and discoloration.
   d) Check the condition of the contacts for wear and pitting.
   e) Check the contactors for free and smooth operation.
   f) Meg the motor and record readings.
7. Startup / Checkout Procedure
   a) Start the fan.
   b) Verify the operation of the starter.
   c) Check and record supply and control air pressure.
   d) Verify the operation of the control system while the fan is operating.
   e) Log the operating conditions after the system has stabilized.
   f) Review operating procedures with operating personnel.
   g) Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

Scheduled Running Inspection (fans)

1. Check the general operation of the fan.
2. Check and record supply and control air pressure.
3. Verify the operation of the control system.
4. Log the operating conditions after the system has stabilized.
5. Review operating procedures with operating personnel.
6. Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

Comprehensive Annual Inspection (fans)

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Verify tight bolts, set screws, and locking collars.
   b) Inspect sheaves and pulleys for wear and alignment.
   c) Inspect belts for tension, wear, cracks, and glazing.
   d) Inspect dampers for wear, security, and clearances, if applicable.
   e) Verify clean air filters.
   f) Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.
4. Lubrication
   a) Lubricate fan bearings.
   b) Lubricate motor bearings, if applicable.
5. Controls and Safeties
   a) Verify the operation of the control system while the fan is operating.
   b) Verify the setting of the low temperature safety device, if applicable.
   c) Verify the operation of the pre-heat control device, if applicable.
   d) Verify the operation of the cooling control device, if applicable.
   e) Verify the operation of the re-heat control device, if applicable.
   f) Verify the operation of the humidity control device, if applicable.
6. Motor and Starter
   a) Clean the starter and cabinet.
   b) Inspect the wiring and connections for tightness and signs of overheating and discoloration.

c) Check the condition of the contacts for wear and pitting.
d) Check the contactors for free and smooth operation.
e) Meg the motor and record readings.
f) Check volts and amps of the motor.

Lubricate/Grease Bearings

1. Lubricate and/or grease bearings according to manufacturer's specifications

MEG Motor

1. Check the integrity of the insulation on the motor windings and the motor leads, using a megohm meter.

Coils

Maintenance Procedure

1. Record and report abnormal conditions.
2. Visually inspect the coil for leaks.
3. Inspect the coil for cleanliness.

Pumps

Annual Inspection

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Check motor shaft and pump shaft for alignment, if applicable.
   b) Inspect the coupling for wear.
   c) Verify that the shaft guard is in place and tight, if applicable.

d) Verify water flow through the pump.

e) Check for leaks on the mechanical pump seals, if applicable.
f) Verify proper drip rate on the pump seal packing, if applicable.
g) Verify smooth operation of the pump.
h) Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

4. Lubrication
   a) Lubricate the motor bearings as necessary.
   b) Lubricate the pump bearings as necessary.
5. Motor and Starter
   a) Clean the starter and cabinet.
   b) Inspect wiring and connections for tightness and signs of overheating and discoloration.
   c) Meg the motor.
   d) Verify tight connections on the motor terminals.
   e) Check the condition of the contacts for wear and pitting, if applicable.
   f) Check the contactors for free and smooth operation.
   g) Verify proper volts and amps.

Pump Run Inspection

1. Verify smooth operation of the pump.
2. Check for leaks on the mechanical pump seals, if applicable.
3. Verify proper drip rate on the pump seal packing, if applicable.
4. Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

Mechanical Starters with Electronic Controls

Comprehensive Annual Maintenance

1. Clean the starter and cabinet.
2. Inspect wiring and connections for tightness and signs of overheating and discoloration.

3. Check condition of the contacts for wear and pitting.
4. Check contactors for free and smooth operation.
5. Check the mechanical linkages for wear, security, and clearances.
6. Verify the overload settings.

VFD Starters

Comprehensive Annual Maintenance

1. Clean the starter and cabinet.
2. Inspect wiring and connections for tightness and signs of overheating and discoloration.
3. Check the tightness of the motor terminal connections.
4. Verify the operation of the cooling loop.
5. Verify proper operation of the frequency drive.

Rooftop Units

Comprehensive Annual Maintenance

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Inspect for leaks and report results.
   b) Calculate refrigerant loss rate and report to the customer.
   c) Repair minor leaks as required (e.g. valve packing, flare nuts).
   d) Visually inspect condenser tubes for cleanliness.
4. Controls and Safeties
   a) Inspect the control panel for cleanliness.
   b) Inspect wiring and connections for tightness and signs of overheating and discoloration.
   c) Verify the working condition of all indicator/alarm lights, if applicable.
   d) Test the low water temperature control device. Calibrate and record setting.

e) Test the low evaporator pressure safety device. Calibrate and record setting.
f) Test the oil pressure safety device. Calibrate and record setting, if applicable.
g) Check programmed parameters of RCM control, if applicable.

5. Lubrication System
   a) Check oil level in the compressor.
   b) Test oil for acid content and discoloration. Make recommendations to the customer based on the results of the test.
   c) Verify the operation of the oil heater. Measure amps and compare reading with the watt rating of the heater.

6. Motor and Starter
   a) Clean the starter and cabinet.
   b) Inspect wiring and connections for tightness and signs of overheating and discoloration.
   c) Check condition of the contacts for wear and pitting.
   d) Check the contactors for free and smooth operation.
   e) Check the tightness of the motor terminal connections.
   f) Meg the motor and record readings.
   g) Verify the operation of the electrical interlocks.
   h) Measure voltage and record. Voltage should be nominal voltage ± 10%.

Comprehensive Maintenance Inspection (RTU Heating Cycle)

1. Perform heating inspection/maintenance applicable to the unit (steam/hot water, gas, electric).
2. Verify smooth operation of the fans.
3. Check the belts for tension, wear, cracks, and glazing.
4. Verify clean air filters.
5. Gas Heat Option
   a) Visually inspect the heat exchanger.
   b) Inspect the combustion air blower fan, and clean, if required.
   c) Lubricate the combustion air blower fan motor, if applicable.
   d) Verify the operation of the combustion air flow-proving device.
   e) Test the operation of the high gas pressure safety device, if applicable. Calibrate, if necessary.
   f) Test the operation of the low gas pressure safety device, if applicable. Calibrate, if necessary.

g) Verify the operation of the flame detection device.
h) Test the operation of the high temperature limit switch. i.. Verify the integrity of the flue system.
i) Verify the operation of the operating controls.
j) Verify the burner sequence of operation.
k) Verify proper gas pressure to the unit and/or at the manifold, if applicable.
l) Perform combustion test. Make adjustments as necessary.

6. Electric Heat Option
   a) Inspect wiring and connections for tightness and signs of overheating and discoloration.
   b) Check and calibrate operating and safety controls, if applicable.
   c) Verify the operation of the heating elements.
   d) Check voltage and amperage and compare readings with the watt rating on the heater.

7. Hot Water / Steam Heat Option
   a) Inspect control valves and traps.
   b) Check and calibrate all operating and safety controls.
   c) Verify the operation of the heating coils.
   d) Verify the operation of the unit low temperature safety device.

Mid-Season Cooling Inspection (RTU)

1. Check the general condition of the unit.
2. Log the operating condition after system has stabilized.
3. Verify the operation of the control circuits.
4. Analyze the recorded data. Compare the data to the original design conditions.
5. Review operating procedures with operating personnel.
6. Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

Comprehensive Maintenance Inspection (RTU - Cooling Cycle)

1. Record and report abnormal conditions, measurements taken, etc.
2. Review logs for operational problems and trends.
3. General Assembly
   a) Inspect for leaks and report results.

b) Calculate refrigerant loss rate and report to the customer.
c) Repair minor leaks as required (e.g. valve packing, flare nuts).
d) Check pulleys and sheaves for wear and alignment.
e) Check belts for tension, wear, cracks, and glazing.
f) Verify clean evaporator coil, blower wheel, and condensate pan.
g) Verify clean air filters.
h) Verify proper operation of the condensate drain.
i) Verify proper operation of the dampers and/or inlet guide vanes, if applicable.

4. Controls and Safeties
   a) Inspect the control panel for cleanliness.
   b) Inspect wiring and connections for tightness and signs of overheating and discoloration.
   c) Verify the working condition of all indicator/alarm lights, if applicable.
   d) Test the low evaporator pressure safety device. Calibrate and record setting, if applicable.
   e) Test the high condenser pressure safety device. Calibrate and record setting, applicable.
   f) Test the oil pressure safety device, if applicable. Calibrate and record setting.
   g) Test the high static pressure safety device, if applicable. Calibrate and record setting.
   h) Verify the operation of the static pressure control device, if applicable.
5. Lubrication
   a) Verify the operation of the oil heater, if applicable.
   b) Lubricate the fan bearings as required.
   c) Lubricate the fan motor bearings as required.
   d) Lubricate the damper bearings, if applicable.
6. Motor and Starter
   a) Clean the starter and cabinet.
   b) Inspect wiring and connections for tightness and signs of overheating and discoloration.
   c) Check the condition of the contacts for wear and pitting.
   d) Check the contactors for free and smooth operation.
7. Startup /Checkout Procedure
   a) Verify the operation of the oil heater.
   b) Verify full water system, including the cooling tower and the condenser.
   c) Verify clean cooling tower and strainers.
   d) Test all flow-proving devices on the condenser water circuit.
   e) Start the condenser water pump and the cooling tower fan(s).

f) Verify flow rate through the condenser.
g) Start the unit.
h) Verify smooth operation of the compressor(s) and fan(s).
i) Check the setpoint and sensitivity of the temperature control device.
j) Verify the operation of the condenser water temperature control device.
k) Verify clean condenser using pressure and temperature.
l) Check operation and setup of the Unit Control Module.
m) Check the superheat and subcooling on the refrigeration circuit(s).
n) Log the operating conditions after the system has stabilized.
o) Review operating procedures with operating personnel.
p) Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

ENERGY SAVINGS PLAN

SECTION 7 – OPTIONAL ENERGY GUARANTEE

OPTIONAL ENERGY GUARANTEE OVERVIEW

NOTE: *The following is meant only to serve as a description of an optional energy guarantee and does not constitute any contractual obligations between Passaic Valley Regional High School and DCO. If Passaic Valley Regional High School chooses to implement an energy guarantee contract, a separate document will be used based on mutual agreement and acceptance of all parties of its terms and conditions.*

A successful energy project consists of a partnership between an ESCO and Owner. Both parties have defined roles and accept their individual responsibilities as well as support any joint initiatives of the program as defined in the RFP and this document. Both DCO and the Passaic Valley Regional High School will have a role in ongoing maintenance and operations as defined in the agreed-upon energy guarantee contractual documents. Both parties will be required to meet their obligations for the guaranteed energy units savings (referred to as "guarantee or savings") to be achieved and to ensure the guarantee stays intact.

DCO will guarantee Passaic Valley Regional High School will achieve 100% of the total energy units savings per the provisions of the agreed-upon energy guarantee contractual documents based on the final selection of ECMs and their associated energy savings as measured and verified by the Owner's third-party, independent firm. The energy savings will be in energy units, not dollars as DCO has no control over the costs of utilities. The energy units guarantee contract shall commence thirty (30) days after the start-up and commissioning of the last Energy Conservation Measure (ECM) and be enforced for a period of one (1) year or until terminated by Passaic Valley Regional High School.

ENERGY SAVINGS PLAN

APPENDICIES

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APPENDIX B	Design Bid Build Procedures
APPENDIX C	Operations & Maintenance Savings
APPENDIX D	Project Changes in Financing
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ENERGY SAVINGS PLAN

APPENDIX A – CONSTRUCTION CONTINGENCY ALLOWANCE

Appendix A – Construction Contingency Allowance

Experience shows that during the construction phase there are four major categories of potential change of scope issues that benefit from having an appropriate Construction Contingency Allowance (CCA).

- Unknown conditions
- Building inspector's modifications
- Project owner requested changes
- Design clarifications or modifications

Unknown Conditions

Renovations to older facilities have greater potential for revealing unknown. Missing or inaccurate Blueprints, deviations from the original blue prints by the original builder and unknown or undocumented modifications during the life of the facility.

Areas such as behind a wall/roof/equipment or under the slab can bring unforeseen conditions which can delay the new construction and change the anticipated scope of the work. Therefore, it is advisable to dedicate a CCA that is higher than that for new construction.

Building Inspection Modifications

A plan review for the local building jurisdiction reviews the construction documents prior to issuing a building permit. However, there remains the likelihood that the building inspector will request modifications to the plans based upon experience and their interpretation of the applicable building code.

While we can ask for code review and documentation, if you hope to get a Certificate of Occupancy under a tight schedule from this same inspector requested modifications will need to be implemented as successfully appeals take time.

Whether it is adding an extra exit sign, smoke detector or fire extinguisher, or whether it is something more significant, it may require more work from the contractor, thus added expense. The CCA is intended to be the source of funds necessary for these requested modifications.

Project Owner Requested Changes

It is nearly impossible to express your every desire during the design phase. You will always see something during construction that you would like to change. There is nothing necessarily wrong with that. The CCA is intended to be the source of funds necessary for these requested changes.

Design Clarifications or Modifications

No designer has ever developed the perfect set of construction documents.

There are always items that can be detailed better or more clearly. The design intent should be adequately reflected in the drawings and specifications so that the contractor can bid and build the ECM to meet the design intent.

However, there will be times during construction when the builder will not be readily able to identify the exact intent of particular details or systems. At that time the builder will submit a Request for Information (RFI) to the designer for clarification or more information. The designer will issue clarifications or directives so that the builder can continue to meet the design intent.

On occasion, the RFI will reveal that something more than was shown in the construction documents is necessary to fulfill the design intent. The clarification or modification may impact the scope of the work to a degree that additional construction costs become necessary.

As long as the design omission is not negligent, the CCA is intended to be the source of funds necessary for these design clarifications or modifications.

Allowance Method

Detailed plans, schematics and specifications for Passaic Valley Regional High School were not available to deliver a cost estimate for each ECM. The budgetary costs carried in the project are based on good faith estimates, contractor supplied budgets for similar ECMs on other recent projects and a database of actual installed costs for various ECMs.

a. Allowance Amount (4% of Hard Costs)

Project total construction contingency allowance amount is 4% of estimated hard costs and is agreed upon by DCO and Passaic Valley Regional High School

ENERGY SAVINGS PLAN

APPENDIX B – DESIGN BID BUILD

Appendix B – Design Bid Build Procedures

Design–bid–build (or **design/bid/build**, and abbreviated **D–B–B** or **D/B/B** accordingly), also known as **Design–tender** (or "design/tender") **traditional method** or **hard bid** is the method of delivery for this project.

Design–bid–build is the traditional method for project delivery and differs in several substantial aspects from design–build.

There are three main sequential phases to the design–bid–build delivery method:

- The design phase
- The bidding (or tender) phase
- The construction phase

Design Phase

In this phase DCO will design and produce bid documents, including construction drawings and technical specifications, on which various contractors will in turn bid to construct the project.

The Energy Savings Plan (ESP) is intended to document owner's project requirements and provide a conceptual and/or schematic design and good faith estimates.

With the ESP DCO will bring in other design professionals including mechanical, electrical, and plumbing engineers (MEP specifications engineers), a fire protection engineer, structural engineer, sometimes a civil engineer and a landscape architect to help complete the construction drawings and technical.

The design document should reflect the intent of the energy savings plan for scope, price, savings, operations & maintenance savings, incentive and schedule.

The finished bid documents are coordinated by the DCO and owner for issuance to contractors during the bid phase.

Bid (or tender) phase

Bidding is according to NJ Public Bid Law and is "open", in which any qualified bidder may participate.

The various contractors bidding obtain bid documents, and then put them out to multiple subcontractors for bids on sub-components of the project.

Questions may arise during the bid period, and DCO will issue clarifications or corrections to the bid documents in the form of addenda.

From these elements, the contractor compiles a complete bid for submission by the established closing date and time bid date.

Bids are to be based on a base bid lump sum plus alternates, bid requirements and alternates are elucidated within the bid documents.

Once bids are received, DCO reviews the bids, seeks any clarifications required of the bidders, investigates contractor qualifications, ensures all documentation is in order (including bonding if required), and advises the owner as to the ranking of the bids.

If the bids fall in a range acceptable to the owner, the project is awarded to the contractor with the lowest reasonable bid.

In the event that all of the bids do not satisfy the needs of the owner the following options become available to DCO:

- Re-bid the construction of the project on a future when monies become available and/or construction costs go down.
- Revise the design of that ECM (at no cost to the client) so as to make the project smaller or reduce features or elements of the project to bring the cost down. The revised bid documents can then be issued again for bid.
    - DCO will provide guidance on energy savings, operation and maintenance savings and incentives to ensure the project is self-funding.
- Revise the design of future ECM(s) (at no cost to the client) so as to make the project smaller or reduce features or elements of the project to bring the cost down. The current bid package can then be contracted
    - DCO will provide guidance on energy savings, operation and maintenance savings and incentives to ensure the project is self-funding.

Construction phase

Once the construction of the project has been awarded to the contractor, the bid documents (e.g., approved construction drawings and technical specifications) may not be altered.

The necessary permits (for example, a building permit) must be achieved from all jurisdictional authorities in order for the construction process to begin.

Should design changes be necessary during construction, whether initiated by the contractor, owner, or as discovered by the architect, DCO will issue sketches or written clarifications and handle the project through allowance (See Appendix A).

The contractor may be required to document "as built" conditions to the owner.

ENERGY SAVINGS PLAN

APPENDIX C – OPERATIONS AND MAINTENANCE SAVINGS

Appendix C – Operation & Maintenance Savings

Operations and Maintenance and other non-energy-related cost savings are allowable in NJ ESIPs, and are defined as reduction in expenses (other than energy cost savings) related to energy and water consuming equipment:

Energy-related cost savings can result from avoided expenditures for operations, maintenance, equipment repair, or equipment replacement due to the ESIP project.

Sources of O&M savings include:

- Termination of service personnel
- Lower maintenance service contract costs
- Decrease in repair costs
    - Avoided repair and replacement costs as a result of replacing old and unreliable equipment
    - Material savings due to new equipment warranties
    - Material savings due to the longer life items not needing replacement
        - In particular, reduction in florescent bulbs due to LED

Termination of service personnel

As a result of the ESIP, a number of the client's maintenance staff members may no longer be required. If there will be a reduction in the government's maintenance staff, O&M savings can be claimed.

A problem could arise if the maintenance staff is not reduced. Then it would be necessary to determine what new O&M responsibilities the facility has taken on, or savings should not be claimed. For example, it could be that a new building was constructed. During the performance period, it is important to establish that any increased maintenance was not due to the equipment installed under the ESIP

Lower maintenance service contract costs

Prior to the implementation of the ESIP mechanical and electrical equipment was maintained by a third party under a maintenance contract. The ESIP replaces the aging equipment with newer, more efficient equipment, which can reduce the service costs to the client.

Decrease in repair costs

The client is responsible for maintenance both before and after the equipment installation. Although there is no reduction in staff for which to claim labor savings, there will be cost savings on replacement materials.

Material-related savings frequently result from lighting and lighting controls projects.

For this project, lighting maintenance savings will result from the following:

1. Reduced material requirements (e.g., lamps)
2. Reduced operating time — Control measures increase equipment life by reducing the burn time of lamps and ballasts
3. Warranty-related savings — newly installed lamps, and fixtures come with a manufacturer warranty of 10 years.

O&M Savings

Project total O&M savings to fund debt service amount: $81,919

Project O&M Savings strategy is agreed upon by DCO and Passaic Valley Regional High School.

ENERGY SAVINGS PLAN

APPENDIX D – PROJECT CHANGES IN FINANCING

Appendix D – Project Changes in Financing

The Energy savings plan has been approved using:

Interest rate of: 2.5%
Term: ..... 20 Years
Construction Term ..... 1 Year
Construction Interest Only Payment of …… TBD by Passaic Valley Regional High School financial advisor
Annual Surplus of no less than $2,400

During financing DCO will provide assistance but does not guarantee the timing of savings or incentives.

While beneficial to the client financing changes are the responsibility of the client, bond counsel and/or financial advisor. DCO represents in no way advice on these financial items

Financial items may include but are not limited to:

- Timing of payments
- Splitting payments into bi-annual, tri-annual, etc.
- Coordination with the client's fiscal year
- Local finance board material, forms and presentations
- Multiple tiered interest rates

ENERGY SAVINGS PLAN

APPENDIX E – INCENTIVES IN DEBT SERVICE

Appendix E – Incentives in Debt Service

Estimated incentive values were calculated in accordance with the New Jersey Clean Energy Program Guidelines. The total incentive amount was calculated to be $409,993 in rebates and incentives - 50%, $204,715, has been applied to the project financial analysis (See Section 4). Please see below and Appendix F for building-by-building details.

Incentive Totals										
BUILDING	INCENTIVE TYPE	QUANTITY	UNITS	INCENTIVE $/UNIT	YEAR 1 INCENTIVE	YEAR 2 INCENTIVE	YEAR 3 INCENTIVE	YEAR 4 INCENTIVE	SUBTOTAL	TOTAL
PASSAIC VALLEY REGIONAL HIGH SCHOOL	P4P 2&3 (electric)	0	kWh	$0.44	$108,554	$108,554	$0	$0	$217,108	$409,430
	P4P 2&3 (natural gas)	0	therms	$5.00	$84,342	$84,342	$0	$0	$168,684	
	Energy Efficiency	182	kW	$32.45	$5,910	$5,910	$5,910	$5,910	$23,639	
				TOTALS	$198,805.54	$198,806	$5,910	$5,910	$409,430	

No implied and/or written guarantee is being made with respective to the receipt of incentives. All incentives estimates carry inherent risks that may jeopardize the receipt of them. Therefore, Passaic Valley Regional High School acknowledges and accepts that any project proposed should not rely on the receipt of incentives as a reason to implement it.

ENERGY SAVINGS PLAN

APPENDIX F – SCHEDULES BY BUILDING

Passaic Valley Regional High School – Baseline Schedules

Passaic Valley Regional High School – Café – Steam Zones - Temperature Schedule (Baseline)						
	School Year - 1/1 to 6/22, 9/4 to 12/31			Summer – 6/22 to 9/3		
	Occ Hrs	Occ Heat/Cool Setpoint	Unocc Heat/Cool Setpoint	Occ Hrs	Occ Heat/Cool Setpoint	Unocc Heat/Cool Setpoint
Monday-Friday	6am-9pm	68F/73F	68F/73F	6am-9pm	68F/73F	68F/73F
Saturday – Sunday	N/A	N/A	68F/73F	N/A	N/A	68F/73F
Holiday	N/A	N/A	68F/73F	N/A	N/A	68F/73F

Passaic Valley Regional High School – UHT -WAC - Temperature Schedule (Baseline)						
	School Year - 1/1 to 6/22, 9/4 to 12/31			Summer – 6/22 to 9/3		
	Occ Hrs	Occ Heat/Cool Setpoint	Unocc Heat/Cool Setpoint	Occ Hrs	Occ Heat/Cool Setpoint	Unocc Heat/Cool Setpoint
Monday-Friday	6am-9pm	70F/73F	70F/73F	6am-9pm	70F/73F	70F/73F
Saturday – Sunday	N/A	N/A	70F/73F	N/A	N/A	70F/73F
Holiday	N/A	N/A	70F/73F	N/A	N/A	70F/73F

Passaic Valley Regional High School – Gym + UHTs - Temperature Schedule (Baseline)						
	School Year - 1/1 to 6/22, 9/4 to 12/31			Summer – 6/22 to 9/3		
	Occ Hrs	Occ Heat/Cool Setpoint	Unocc Heat/Cool Setpoint	Occ Hrs	Occ Heat/Cool Setpoint	Unocc Heat/Cool Setpoint
Monday-Friday	6am-9pm	70F	70F	6am-9pm	70F	70F
Saturday-Sunday	N/A	N/A	70F	N/A	N/A	70F
Holiday	N/A	N/A	70F	N/A	N/A	70F

Passaic Valley Regional High School - Fan Schedule (Baseline)						
	School Year - 1/1 to 6/22, 10/21 to 12/31			Summer – 4/16 – 10/21		
	Occ Hrs	Occ Fan Setpoint	Unocc Fan Setpoint	Occ Hrs	Occ Fan Setpoint	Unocc Fan Setpoint
Monday-Friday	6am-9pm	ON	ON	6am-9pm	ON	Cycle
Saturday – Sunday	N/A	N/A	ON	N/A	N/A	Cycle
Holiday	N/A	N/A	ON	N/A	N/A	Cycle

Passaic Valley Regional High School - DCV Schedule – UV's and AHU's - (Baseline)						
	School Year - 1/1 to 4/15, 10/20 to 12/31			Summer – 4/16 - 10/21		
	Occ Hrs	Occ OA	Unocc OA	Occ Hrs	Occ OA	Unocc OA
Monday-Friday	6am-9pm	Design OA	Design OA	6am-9pm	0 % of SA CFM	0 % of SA CFM
Saturday – Sunday	N/A	N/A	Design OA	N/A	N/A	0 % of SA CFM
Holiday	N/A	N/A	Design OA	N/A	N/A	0 % of SA CFM

Passaic Valley Regional High School - DCV Schedule –RTU - (Baseline)						
	School Year - 1/1 to 4/15, 10/20 to 12/31			Summer – 4/16 to 10/21		
	Occ Hrs	Occ OA	Unocc OA	Occ Hrs	Occ OA	Unocc OA
Monday-Friday	6am-9pm	0% of SA CFM	0% of SA CFM	6am-9pm	Design OA	Design OA
Saturday – Sunday	N/A	N/A	0% of SA CFM A	N/A	N/A	Design OA
Holiday	N/A	N/A	0% of SA CFM	N/A	N/A	Design OA

Passaic Valley Regional High School – Energy Management System Schedules

Passaic Valley Regional High School - Temperature Schedule (EMS)						
	School Year - 1/1 to 4/15, 10/20 to 12/31			Summer – 4/16 to 10/21		
	Occ Hrs	Occ Heat/Cool Setpoint	Unocc Heat/Cool Setpoint	Occ Hrs	Occ Heat/Cool Setpoint	Unocc Heat/Cool Setpoint
Monday-Friday	6am-9pm	70F/73F	65F/80F	6am-9pm	65F/73F	65F/80F
Saturday – Sunday	8am-5pm	70F/73F	65F/80F	8am-5pm	65F/73F	65F/80F
Holiday	8am-5pm	70F/73F	65F/80F	8am-5pm	65F/73F	65F/80F

Passaic Valley Regional High School – EMS UV Fan Schedule (EMS)						
	School Year - 1/1 to 6/22, 10/21 to 12/31			Summer – 4/16 – 10/21		
	Occ Hrs	Occ Fan Setpoint	Unocc Fan Setpoint	Occ Hrs	Occ Fan Setpoint	Unocc Fan Setpoint
Monday-Friday	6am-9pm	ON	Cycle	12am-12pm	Cycle	Cycle
Saturday – Sunday	8am-5pm	ON	Cycle	12am-12pm	Cycle	Cycle
Holiday	8am-5pm	ON	Cycle	12am-12pm	Cycle	Cycle

Passaic Valley Regional High School – EMS RTU Fan Schedule (EMS)						
	School Year - 1/1 to 6/22, 10/21 to 12/31			Summer – 4/16 – 10/21		
	Occ Hrs	Occ Fan Setpoint	Unocc Fan Setpoint	Occ Hrs	Occ Fan Setpoint	Unocc Fan Setpoint
Monday-Friday	6am-9pm	ON	Cycle	6am-9pm	ON	Cycle
Saturday – Sunday	8am-5pm	ON	Cycle	8am-5pm	ON	Cycle
Holiday	8am-5pm	ON	Cycle	8am-5pm	ON	Cycle

Passaic Valley Regional High School - DCV Schedule – Gym - (EMS)						
	School Year - 1/1 to 4/15, 10/20 to 12/31			Summer – 4/16 - 10/21		
	Occ Hrs	Occ OA	Unocc OA	Occ Hrs	Occ OA	Unocc OA
Monday-Friday	7am-6pm	20% of SA CFM	5% of SA CFM	7am-6pm	0% of SA OA	0% of SA CFM
Saturday – Sunday	8am-5pm	20% of SA CFM	5% of SA CFM	N/A	N/A	0% of SA CFM
Holiday	8am-5pm	20% of SA CFM	5% of SA CFM	N/A	N/A	0% of SA CFM

Passaic Valley Regional High School - DCV Schedule – RTU - (EMS)						
	School Year - 1/1 to 4/15, 10/20 to 12/31			Summer – 4/16 to 10/21		
	Occ Hrs	Occ OA	Unocc OA	Occ Hrs	Occ OA	Unocc OA
Monday-Friday	6am-9pm	0% of SA CFM	0% of SA CFM	7am-6pm	10% of SA CFM	5% of SA CFM
Saturday – Sunday	N/A	N/A	0% of SA CFM A	8am-5pm	10% of SA CFM	5% of SA CFM
Holiday	N/A	N/A	0% of SA CFM	8am-5pm	10% of SA CFM	5% of SA CFM

Passaic Valley Regional High School - DCV Schedule – UVs - (EMS)						
	School Year - 1/1 to 4/15, 10/20 to 12/31			Summer – 4/16 - 10/21		
	Occ Hrs	Occ OA	Unocc OA	Occ Hrs	Occ OA	Unocc OA
Monday-Friday	7am-6pm	Design OA	5% of SA CFM	7am-6pm	0% of SA OA	0% of SA CFM
Saturday – Sunday	8am-5pm	Design OA	5% of SA CFM	N/A	N/A	0% of SA CFM
Holiday	8am-5pm	Design OA	5% of SA CFM	N/A	N/A	0% of SA CFM

APPENDIX G – LIGHTING LINE BY LINES

SPREADSHEETS PROVIDED IN A SEPARATE FILE

APPENDIX H – 3rd PARTY ENGINEERING REVIEW

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The following is a list of questions related to the calculations performed on the buildings for the Passaic Valley Regional High School Energy Savings Plan.

ECM-1: LED Replacement with Controls

1. How was lighting watt per square foot determined?
    a. The lighting watts per square foot was determined from the LxL survey that was conducted in the High School – see attached.

ECM-2: Energy Management System

No questions

ECM-3: Demand Control Ventilation

1. ECM references proposed temperature, fan, and DVC schedule in appendix H. Where is appendix H located?
    a. There was a typo in the appendix list. Schedules by building are provided in Appendix F.

2. How was 9pm setback determined?
    a. The 9pm setback was utilized as part of the parametric runs in eQuest to model DCV. This is a conservative way to model DCV in eQuest due to the building being representative of design conditions until 9PM.

ECM-8: Plug Load Controls

2. What is the assumed device reduction schedule?
    a. The plug load device reduction was determined from the LxL survey that was conducted in the High School – see attached.

ECM-11: Combined Heat and Power Unit

1. Please correct. Table of contents(ESP page 21) identifies combined heat and power unit as "ECM 11," but description identifies EMC as "EMC 10"(ESP page 60).
    a. Revised in Rev.1 Energy Savings Plan

ECM-15: Steam Trap Replacement

1. Please correct. Table of contents(ESP page 21) identifies steam trap replacement as "ECM 15," but description identifies EMC as "EMC 14"(ESP page 70).
    a. Revised in Rev.1 Energy Savings Plan

ENERGY SAVINGS PLAN